Bern University
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Ecosystem Services of Sheep Farming in Mountain Regions of Europe

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Livestock Farming in Mountain Areas

- **Dominant land use in mountain** grassland ecosystems (Alkemade *et al*. 2013

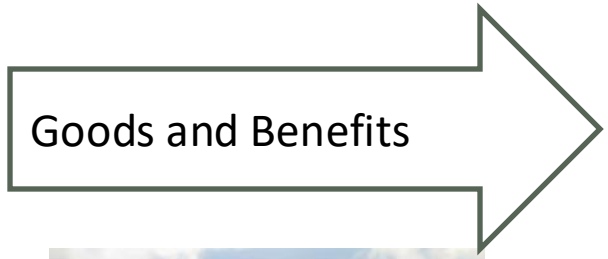
Image: Eurostat, 2024

- Sheep: **-9,7%** compared to 2014 (Eurostat, 2024)

Zuliani et al., 2021

Objectives and Research Questions

- This study reviews how mountain sheep farming contributes to the delivery of ecosystem services in European mountain regions, examines whether these contributions differ across regions, and describes the main ecosystem services provided.



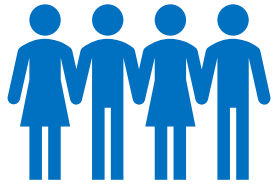


Image: Fundación Monte Mediterráneo

Method:

Review
- Clarivate Web of Science (June 2024)
- Abstract reading

116

1st Selection
- Relevant to mountain regions of Europe
- Relevant to sheep Farming

89

2nd Selection
- At least 3 mentions to sheep*
- In mountain areas or study area with elevation of 600 m a.s.l or higher
- Relevant to the provision of ES

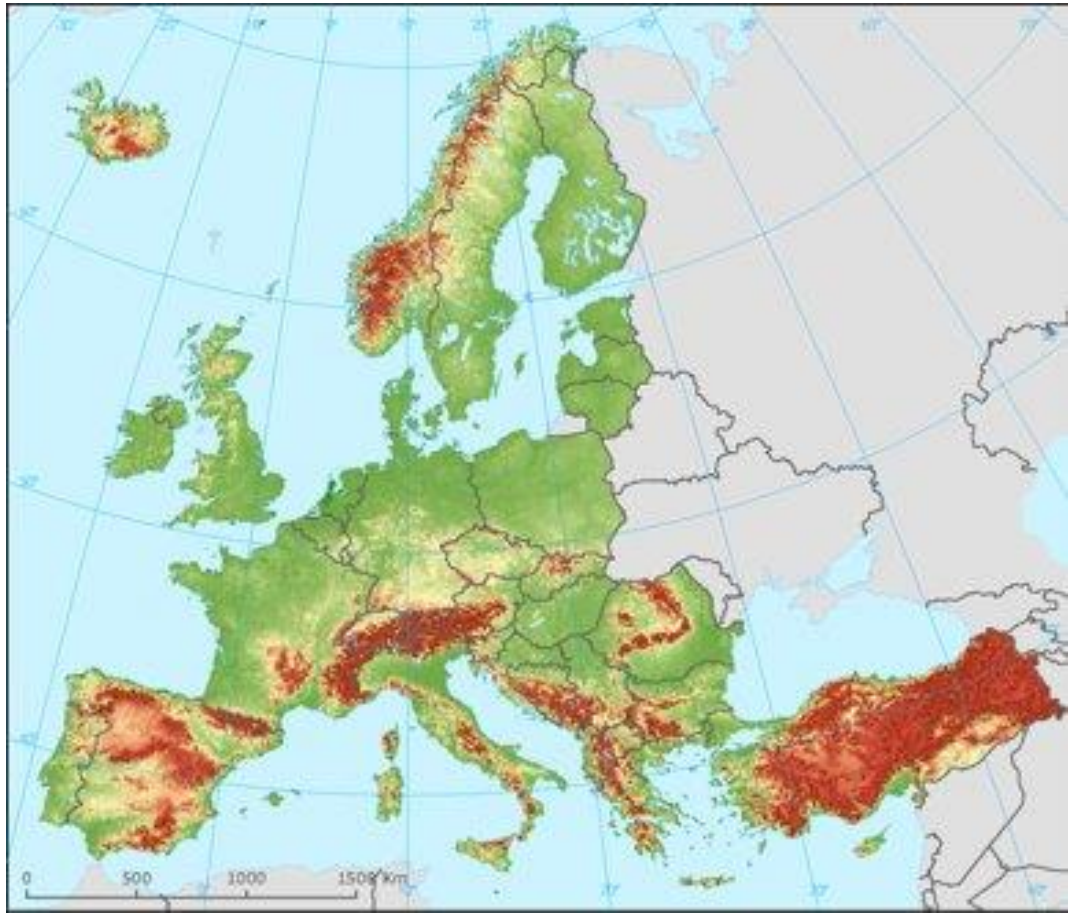
66

Classifi-cation
- Mountain region
- Country
- Year of publication
- ES class (*Common International Classification of Ecosystem Services*)

56

Results and discussion:

Most Studied Regions



Source: European Environmental Agency

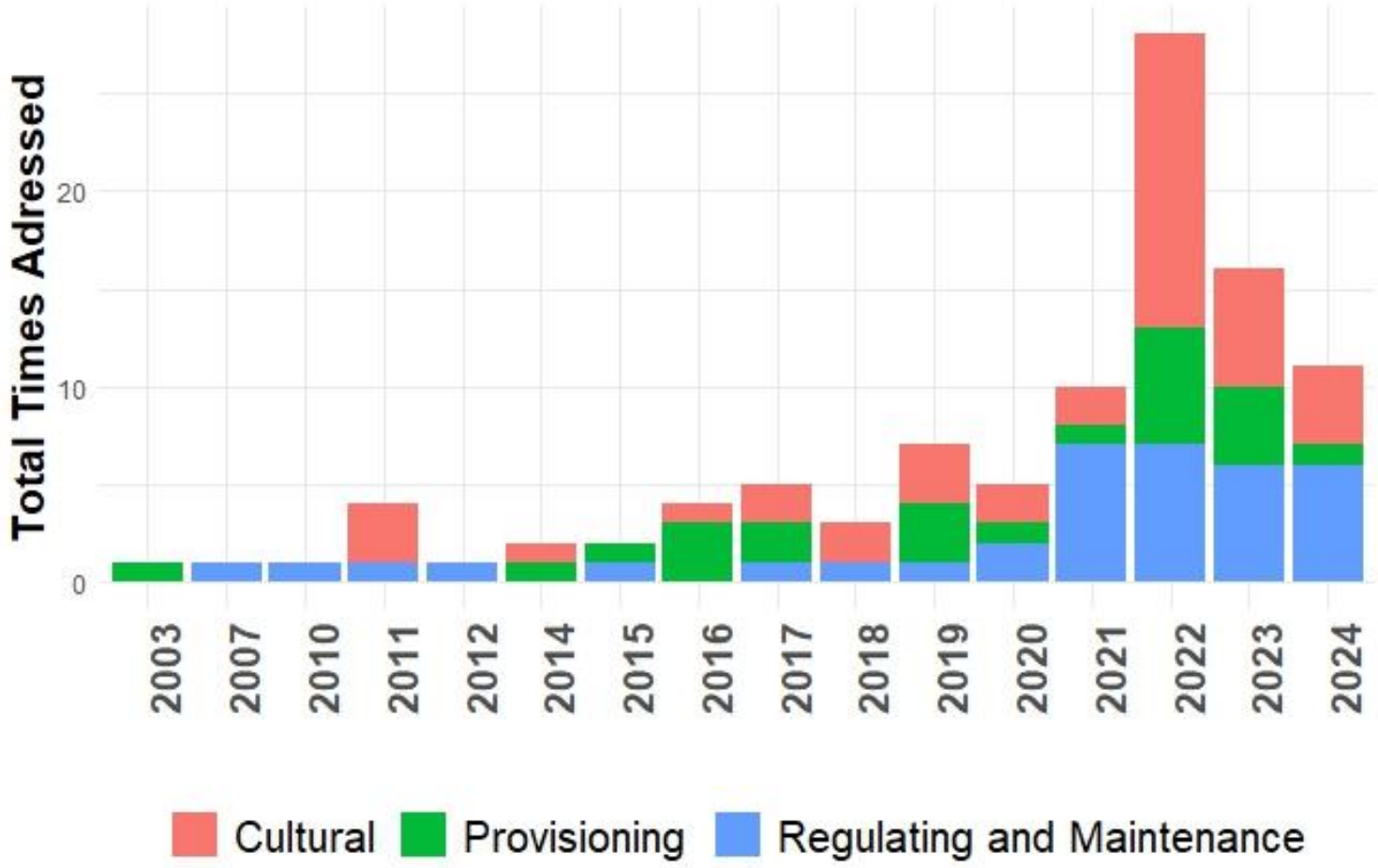
Country	Percentage of total Publications
Spain	30.0 %
Italy	12.5 %
Switzerland	10.7 %
France/Greece	7.1 % each
Austria/Poland/ Romania/UK	5.4 % each
Multiple/Norway/Portugal	3.6 % each

Mountain Region Top 6	Percentage of total Publications
Alpine	17.8 %
Carpathians	12.5 %
Basque Uplands	7.1 %
Pyrenees	7.1 %
Cantabrian	7.1 %
Sardinian Mountains	3.0 %

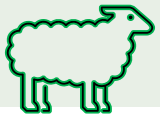
Research trend over Time: increasing emphasis on Regulating and Cultural Ecosystem Services

Most publications focused on a single ecosystem service:

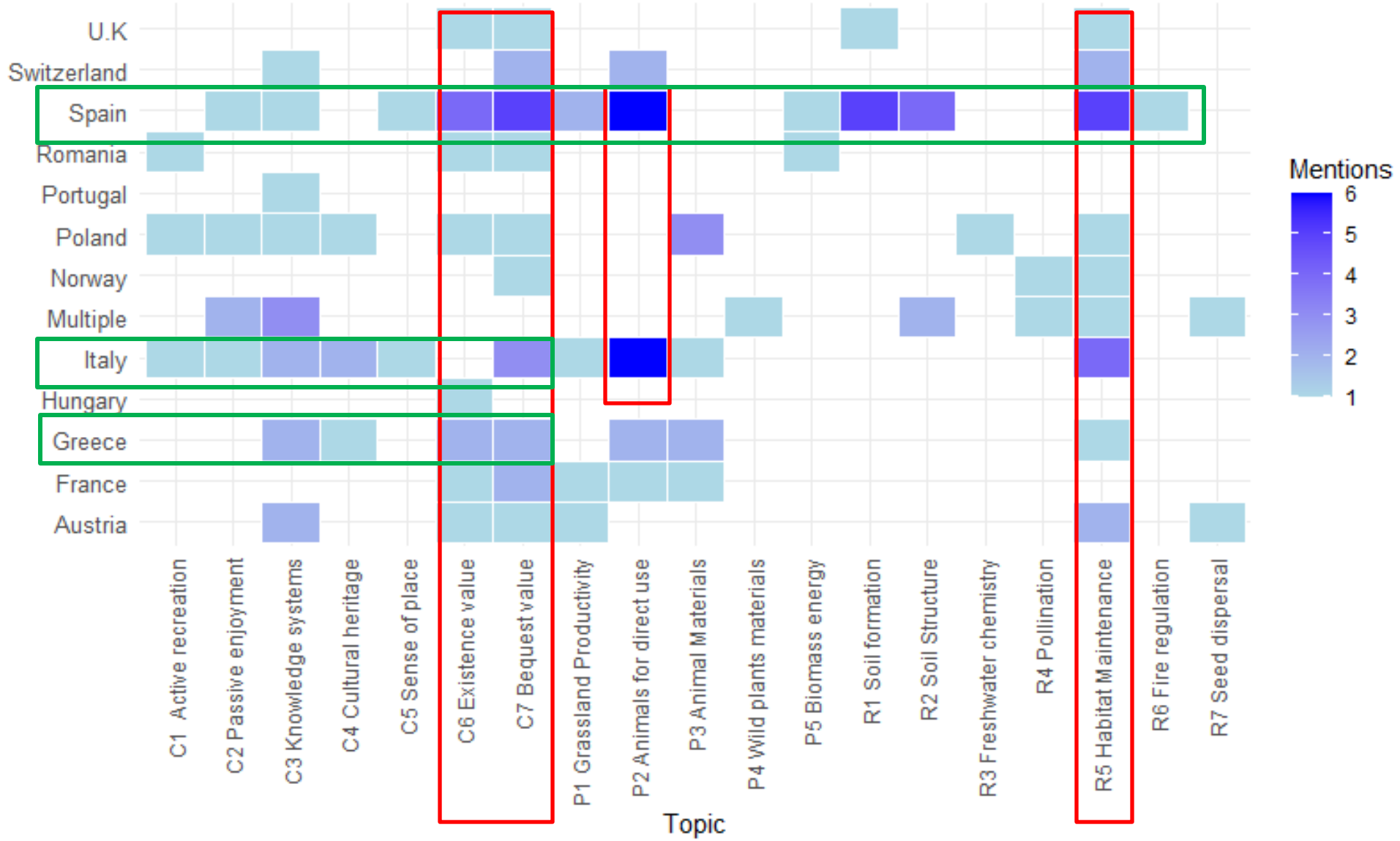
69.7% addressed one section, while 25.0% covered two sections and only 5.3% considered three sections.



Overview of Main Ecosystem Service Classes Studied

CICES Section	CICES Class: Description	Country (Top 3)
Regulating and Maintaining	Effect on nursery populations and habitats or breeding grounds 	Spain Italy Switzerland
Cultural	Effect on living systems whose inter-generational existence or conservation is important to people (**landscape changes/bequest value)** 	Spain France Greece/Norway/Italy/ Switzerland
Provisioning	Animals reared for nutritional purposes 	Spain Italy Greece/Switzerland
Cultural	Effect on living systems whose contemporary existence or conservation is important to people (**farming for conservation/existence value**) 	Spain France Greece

Countries focus differently on Ecosystem Services



Different grazing systems across Europe can influence the provision of ecosystem services within protected areas

Intermittent Grazing Period/ Transhumance
Basque Uplands
Provisioning/Regulating /Cultural
Garmendia et al., 2022

https://www.wildtransylvania.com

Mixed Grazing/Rotational grazing
Carpathians
Provisioning/Regulating/Cultural
Janisova et al., 2023

Sheep farming contributes to landscape heterogeneity as a cultural ecosystem service

Local Breed: Land use
Italian Alps
Provisioning/cultural
Teston et al., 2022

(a) (b)

Figure 2. On the left (a), the Alpagota breed; on the right (b), a Lamon sheep.

Figure 7. Patches managed by a single farm involved in this study.

Image: engandinerschaaf.ch

Land use: shrub encroachment/hardy breeds
Swiss Alps
Provisioning/Cultural
Pauler et al., 2022

Grazing exclusion/Grazing History
Cantabrian mountains
Cultural
Fernández Garcia and Calvo, 2023

Mountain sheep farming provides high-quality and diverse food products

Higher unsaturated fatty acid profiles
Higher antioxidant capacities
Certified traditional products
Provisioning
Basque Uplands:
Bravo Lamas et al., 2018, Garmendia et al., 2022
Sardinian Mountains:
Martini et al. 2021,
Balkan/Southeast Europe:
Skordos et al., 2024

Garmendia et al., 2022

Socioeconomic drivers of land use change: Focus on regions with Specialty products

Policy

Competitiveness

Intensification

Land abandonment

Shrub overgrowth

Bernués et al., 2011-**Multiple**
Gartzia et al., 2016- **Spain**
Chouvardas et al., 2022-**Greece**

Sources:
www.brewminate.com
www.lacucinaitaliana.com
www.wsl.ch

Conclusions:

- **Positive effects**:
  - Provision of Ecosystem Services if **grazing management** is considered
  - Landscape conservation and heterogenicity
- **Contributions differ** according to geographical conditions, agricultural practices and production systems
- Although countries focus their interests in different ways, **landscape-related ecosystem services** (ES) and **habitat maintenance ES** are common throughout the European region.
- To understand the **multifactorial characteristics** of the provision of ecosystem services (ES) in different regions of Europe, it is necessary to consider multiple dimensions of the ES approach.

Les Alpilles, Mountain Landscape near South-Reme. Vincent van Gogh, 1889

Thank you

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