Internationale Grünland-Konferenz/International Grassland Conference 2025 in Garmisch-Partenkirchen

SUSALPS

Internationale Grünland-Konferenz 2025

Report of Contributions

Contribution ID: **24** Type: **Poster presentation (4:40 PM - 6:30 PM)**

Mountain pastures

Tuesday 15 July 2025 16:40 (1h 50m)

ABC

Primary author: Dr RAMM, Elisabeth (IMK-IFU - KIT)

Presenter: Dr RAMM, Elisabeth (IMK-IFU - KIT)

Session Classification: Poster Session & Get-Together (including Beer & Pretzels)

Contribution ID: **25** Contribution code: **2-PMD PM)** Type: **Oral presentation (9:10 AM - 4:10**

Keynote: The soil microbiome –Mitigator or origin of climate change ?

Tuesday 15 July 2025 10:55 (30 minutes)

The soil microbiome plays a pivotal role in biogeochemical cycles, particularly in carbon and nitrogen cycling, which are central to the regulation of Earth's climate. As global climate change accelerates, understanding whether the soil microbiome functions primarily as a mitigator or as a contributor to this threat is increasingly critical.

Recent advances in metagenomics, isotope tracing, and environmental modeling have revealed that soil microbial communities significantly influence carbon fluxes between terrestrial ecosystems and the atmosphere. Microbial processes such as SOM decomposition, nitrification, denitrification, and methanogenesis govern the turnover of key greenhouse gases, including carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4). In stable ecosystems, especially unmanaged forests and undisturbed grasslands, microbes facilitate carbon sequestration by stabilizing organic matter in soils and promoting plant-microbe symbioses that enhance biomass productivity and drought resilience. These functions position the soil microbiome as a potential climate change mitigator.

However, microbial contributions to climate change are highly context dependent. Disturbances such as intensive agriculture, deforestation, and permafrost thawing alter microbial community structure and function, often leading to elevated greenhouse gas emissions turning the soil microbiome into a potential accelerator of climate change.

Thus, the answer to the question - whether the soil microbiome is a mitigator or origin of climate change?—is not binary. The soil microbiome is both, and its trajectory is ultimately shaped by human stewardship as well as environmental conditions including climate change itself.

The key question is: How can microbial processes be managed or engineered to enhance their climate-mitigating capabilities? Promising strategies include promoting beneficial microbial taxa through conservation agriculture, rewilding degraded lands, applying biochar, and developing microbial inoculants designed to stabilize soil carbon. However, the high complexity and variability of microbial communities on the one hand and differences in site specific properties like soil type, management or climate on the other hand exacerbate prediction and control. Thus the "One fits all solution"might be never achieved. Furthermore, current Earth system models inadequately represent microbial processes, underscoring the need for more integrative research at the intersection of microbiology, soil science, and modeling.

The presentation will give an overview about current state of the art describing the dual role of the soil microbiome that can either buffer or exacerbate climate change mainly focussing on grassland ecosystems. The presentation will also address the question of the stoichiometry of nutrients and if subsequent adaptations in management might be a possibility to induce targeted changes in the soil microbiome composition and activity pattern, which could also influence greenhouse gas emission pattern .

Primary author: Prof. SCHLOTER, Michael (Helmholtz Zentrum München)

Co-author: Dr SCHULZ, Stefanie

Presenter: Prof. SCHLOTER, Michael (Helmholtz Zentrum München)

Session Classification: Plant & Microbial Biodiversity

Track Classification: Day 1: Science (English) / Tag 1: Wissenschaft (Englisch): Plant & Microbial Biodiversity

Contribution ID: **26** Contribution code: **4-SEC** Type: **Oral presentation (9:10 AM - 4:10 PM)**

Biomass production of Grasslands: Spatial distribution of biomass production and feed demand in two contrasting regions of Bavaria, Germany

Tuesday 15 July 2025 15:55 (15 minutes)

For agriculture, biomass production for feeding livestock is an essential ecosystem service of grasslands. In line with the European Green Deal's farm-to-fork strategy, maximizing fodder production from existing grasslands is more sustainable than relying on high-intensive cropland feed. Reducing imports and dependency on cropland feed is a global environmental goal. However, it remains unclear whether current grassland resources can sufficiently meet livestock's energy needs. This study assesses the balance of metabolizable energy (ME) from grasslands in two contrasting regions of Bavaria, Germany. We estimate the ME balance per farm and year using data from the Integrated Administration Control System (IACS), including field usage, livestock information, and modeled yield data. We analyze variations between a dry year (2018) and a typical year (2020) under conventional and organic farming. Results show an average ME deficit of ~1,000 GJ per farm (equivalent to 17 dairy cows) in northern Bavaria, whereas the (pre-)Alpine region in southern Bavaria generally shows surpluses, roughly one potential additional dairy cow per farm (~60 GJ surplus). Within the southern region, a north-south trend appears, with deficits in the north and surpluses in the south. No clear pattern emerges in northern Bavaria. Organic farms tend to exhibit higher ME surpluses than conventional farms. A geographically weighted regression reveals that elevation, precipitation, agri-environmental schemes, and farming practices significantly influence ME balances, with effects varying spatially. These findings underscore the need of region-specific strategies to optimize grassland fodder production and enhance the resilience of livestock farming in a changing climate.

Primary authors: ANNUTH, Sylvia Helena; SCHMITT, Thomas (Karlsruhe Institute of Technology (KIT))

Co-authors: BOOS, Carolin (Karlsruhe Institute of Technology (KIT)); HÜLSMANN, Lisa (University of Bayreuth); REINERMANN, Sophie (German Aerospace Center (DLR)); KOELLNER, Thomas (University of Bayreuth)

Presenter: ANNUTH, Sylvia Helena

Session Classification: Socioeconomy

Track Classification: Day 1: Science (English) / Tag 1: Wissenschaft (Englisch): Socioeconomy

Contribution ID: **27** Contribution code: **4-SEC** Type: **Oral presentation (9:10 AM - 4:10 PM)**

An agent-based model to simulate field-specific nitrogen fertilizer applications in grasslands

Tuesday 15 July 2025 15:40 (15 minutes)

Fertilization plays an important role in grassland management and decisions are usually made at farm level. Data on fertilizer application rates are crucial for an accurate assessment of the effects of grassland management on ecosystem services. However, these are generally not available on farm/field scale. To close this gap, we present an agent-based model for Fertilization In Grasslands (FertIG). Based on animal, landuse, and cutting data, the model estimates grassland yields and calculates field-specific amounts of applied organic and mineral nitrogen on grassland (and partly cropland). Furthermore, the model considers different legal requirements (including fertilization ordinances) and nutrient trade among farms. FertIG was applied to a grassland-dominated region in Bavaria, Germany comparing the effects of changes in the fertilization ordinance as well as nutrient trade. The results show that the consideration of nutrient trade improves organic fertilizer distribution and leads to slightly lower mineral N applications. On a regional scale, recent legal changes (fertilization ordinance) had limited impacts. Limiting the maximum applicable amount of organic N to 170 kg N/ha fertilized area instead of farm area as of 2020 hardly changed fertilizer application rates. No longer considering application losses in the calculation of fertilizer requirements had the strongest effects, leading to lower supplementary mineral N applications. The model can be applied to other regions in Germany and, with respective adjustments, in Europe. Generally, it allows comparing the effects of policy changes on fertilization management at regional, farm and field scale.

Primary author: Dr KAIM, Andrea (Helmholtz-Zentrum für Umweltforschung - UFZ)

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Presenter: Dr KAIM, Andrea (Helmholtz-Zentrum für Umweltforschung - UFZ)

Session Classification: Socioeconomy

Track Classification: Day 1: Science (English) / Tag 1: Wissenschaft (Englisch): Socioeconomy

Contribution ID: **28** Contribution code: **3-RSM PM)** Type: **Oral presentation (9:10 AM - 4:10**

Keynote: Grassland ecosystem services in a changing climate –combining advisory guidelines and process-based modelling to support adaptation

Tuesday 15 July 2025 13:10 (30 minutes)

The National Climate for Climate Services (NCCS) is currently implementing a programme aimed at developing decision-making tools for dealing with climate change in Switzerland. As a contribution to "Ecosystem Services", one of the projects included in the programme, Agroscope is setting up an interactive information platform that will allow users to display the projected impacts of climate change on grassland ecosystem services. Given the practical scope, it is important that the data displayed on the platform match the information already available for advising stakeholders. For instance, the current fertilisation recommendations in the official guidelines published by Agroscope target yield levels that reflect the empirical knowledge obtained from field trials and monitoring programmes. To ensure consistency with this information, a mixed approach was therefore selected to develop the new platform, in which empirical relations between elevation, climate and management deliver the basis for creating maps of current productivity levels, while simulations with a process-based model driven with climate change scenarios are conducted to chart the impacts of elevated CO2 concentrations, rising temperatures and shifts in precipitation patterns on grassland productivity. This presentation will illustrate the steps involved in the development of the platform and provide initial impressions of the final product.

Primary author: Dr CALANCA, Pierluigi (Agroscope)

Co-authors: KRAMER, Kevin; DOS REIS MARTINS, Marcio

Presenter: Dr CALANCA, Pierluigi (Agroscope)

Session Classification: Remote Sensing & Modelling

Track Classification: Day 1: Science (English) / Tag 1: Wissenschaft (Englisch): Remote Sensing & Modelling

Contribution ID: **29** Contribution code: **3-RSM PM)** Type: **Oral presentation (9:10 AM - 4:10**

Retrieval of grassland traits from optical satellite data –the challenge of developing transferable models

Tuesday 15 July 2025 14:10 (15 minutes)

Spatially explicit information on grassland traits (e.g., biomass, plant N content) can support the optimization of grassland management. Previous studies demonstrated the potential of remote sensing to retrieve different plant traits in grasslands using multispectral and hyperspectral sensors. However, most of these studies used empirical approaches and are therefore hardly transferable to other regions. Hybrid retrieval approaches, combining physically-based models with machine learning (ML), aim for a better model generalization and transferability. These hybrid approaches were mainly developed for hyperspectral data and crops such as wheat and maize. In this study, we developed and tested hybrid retrieval models for different grasslands traits like aboveground biomass (AGB) and canopy N content based on the radiative transfer model (RTM) PROSAIL-PRO and Gaussian progress regression (GPR) using hyperspectral EnMAP data. Three datasets of in-situ and partially corresponding satellite data of differently managed grasslands from Poland, Germany, and Italy, were available for model calibration and validation. Finally, the trained retrieval models were applied to available EnMAP scenes of the test regions to map the selected grassland traits. Despite promising results in the model testing, the validation results of the retrieval models were not satisfying. In our contribution we will present details of our approach and the results as well as the challenges in developing transferable retrieval models for grasslands.

Primary author: Dr SCHUCKNECHT, Anne (OHB System AG)

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Presenter: Dr SCHUCKNECHT, Anne (OHB System AG)

Session Classification: Remote Sensing & Modelling

Track Classification: Day 1: Science (English) / Tag 1: Wissenschaft (Englisch): Remote Sensing & Modelling

Contribution ID: **30** Contribution code: **3-RSM PM)** Type: **Oral presentation (9:10 AM - 4:10**

SatGrass: Satellite based estimation of grassland yield and quality dynamics

Tuesday 15 July 2025 13:40 (15 minutes)

Grassland represents the most important land-use system in European alpine regions. Various utilisation intensities caused by different site conditions, small-scaled structures and multiple cuts per growing season impede a systematic estimation of yield and forage quality. During the growth of grassland, the biomass increases, while at the same time, the forage quality decreases with continu-ing plant development. Objective estimates of these two parameters in near-real time are difficult to make, even for experienced observers, but would be essential for optimizing grassland manage-ment. In addition, continuous yield and quality monitoring on a regional scale would be an instru-ment for statistical analysis, agricultural policy and advisory services and a basis for risk manage-ment. The impact of climate change, particularly the increasing risk of drought, requires objective and regional-based yield assessments for efficient climate adaptation and mitigation.

In the SatGrass project, we combine remote sensing, weather and grassland data to calibrate and validate yield and quality estimation models based on 211 meadows throughout Austria. On these fields, yields were measured every two weeks during the growing seasons 2021 to 2023 for three randomly selected square meters each (12,063 samples). We also assessed the plant composition and the leaf area index (15,610 AccuPAR measurements). The three replicated fresh matter samples were mixed to 4021 samples and analyzed for dry matter yield and forage quality (crude protein content). The models need to consider the start of the growing season (SOS). Therefore, we established a new methodology for identifying the SOS by combining remote sensing (MODIS NDVI at 250m) and temperature thresholds from daily weather data. The end of each growth is determined by the cut. With 1400 observations of cut dates, we developed two cut models, one based on Sentinel-2 and the other on a combination of Sentinel-2 and Sentinel-1 using a fitted NDVI curve obtained by iteratively smoothing the upper envelope of the actual observations using the Whittaker smoother. Cuts are detected by meeting a threshold in the difference between the fitted NDVI curve and the actual observed NDVI values. The yield and quality models are based on machine learning algorithms with a sequential multilayer model implemented in R (Keras for Ten-sorFlow). The input layer for the biomass estimation includes aggregated weather data and Senti-nel-2 based vegetation indices.

The SatGrass scientific approach, which involved collecting extensive ground-truth data and modelling SOS, cut dates, grassland yield and forage quality based on this unique database, has been completed successfully. Because of the high quality and robustness of the results, an operational system is now being implemented as a mobile and a dashboard application with the support of the European Space Agency and the Austrian Federal Ministry of Agriculture and Forestry, Regions and Water Management to make the results available to farmers and agricultural organizations as a management and monitoring tool of real-time information of grassland yield and forage quality.

Primary author: Dr SCHAUMBERGER, Andreas (Agricultural Research and Education Center (AREC) Raumberg-Gumpenstein)

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Session Classification: Remote Sensing & Modelling

Track Classification: Day 1: Science (English) / Tag 1: Wissenschaft (Englisch): Remote Sensing & Modelling

Contribution ID: **31** Contribution code: **2-PMD PM)** Type: **Oral presentation (9:10 AM - 4:10**

Grassland bud and shoot demographic responses to single and recurrent droughts vary across an aridity gradient

Tuesday 15 July 2025 11:55 (15 minutes)

Clonal demographic traits play important roles in regulating community dynamics. Yet, it remains unclear how the responses of these clonal traits to drought might depend on previous drought exposure, and how drought responses vary among grasslands. We conducted a repeated drought experiment across four grasslands along an aridity gradient in the Mongolian plateau. We assessed the effects of single (precipitation reduction in 2021-2022) vs. recurrent (precipitation reduction in 2015-2018 and 2021-2022) drought on bud density, shoot density, and the ratio of bud to shoot density. Drought reduced bud density at all grasslands and shoot density at most grasslands. Drought reduced the ratio of bud-to-shoot density only in the most arid grasslands. Recurrent drought had larger negative effects than a single drought on bud density and composition of bud and shoot at only one of four grasslands, and on shoot density at two of four grasslands. Our results suggest that previous drought exposure can alter the response of plant clonal demographic traits to subsequent drought in some but not all grasslands and that responses can vary with mean climate.
Keywords: bud limitation, climate change, drought frequency, population regeneration, Mongolian plateau

Primary author: TENIWU, Teniwu (University of Bayreuth)

Co-author: Prof. JENTSCH, Anke (University of Bayreuth)

Presenter: TENIWU, Teniwu (University of Bayreuth)

Session Classification: Plant & Microbial Biodiversity

Track Classification: Day 1: Science (English) / Tag 1: Wissenschaft (Englisch): Plant & Microbial Biodiversity

Contribution ID: **32** Contribution code: **1-BGC PM)** Type: **Oral presentation (9:10 AM - 4:10**

Climate Change Impacts on Water Fluxes in Montane Grassland: Insights from Lysimeter Experiments and Catchment-Scale Modeling

Tuesday 15 July 2025 10:10 (15 minutes)

Montane grasslands play a vital role in regional water cycling and agricultural productivity, yet their response to climate change remains insufficiently understood. This study presents findings from a multi-year climate manipulation experiment in the Austrian Alps, where high-precision lysimeters combined with warming (+3 ℃) and elevated CO_2 concentrations (+300 ppm) were used to assess changes in evapotranspiration (ET), soil moisture, seepage, and biomass yield. A modeling framework based on HYDRUS-1D and Penman–Monteith formulations was applied to extrapolate results across scales. Elevated CO_2 consistently reduced ET and increased seepage due to partial stomatal closure, despite no significant change in leaf area index. In contrast, warming increased ET and reduced groundwater recharge, particularly during dry spells. When combined, the CO_2-induced water-saving effect only partially offset the warming-induced losses. Drought years (2018–2020) revealed strong yield reductions under ambient and warmed conditions, while elevated CO_2 mitigated these effects. Additional isotope tracing experiments using deuterium-labeled water showed altered post-drought soil water transport under combined warming and CO_2 enrichment, with reduced mixing and delayed infiltration. Upscaling using multiple hydrological models revealed differing sensitivities at plot and catchment scale, emphasizing the need for multi-model approaches in future impact assessments. Our results underline the importance of incorporating vegetation response to CO_2 in ecohydrological models and suggest that montane grasslands may provide limited resilience to climate-driven shifts in water availability.

Primary author: Dr HERNDL, Markus (HBLFA Raumberg-Gumpenstein Institut für Pflanzenbau und Kulturlandschaft Abteilung Umweltökologie)

Co-authors: FORSTNER, V.; MATEVŽ, V; RADOLINSKI, J.; BAHN, M.; BIRK, S.

Presenter: Dr HERNDL, Markus (HBLFA Raumberg-Gumpenstein Institut für Pflanzenbau und Kulturlandschaft Abteilung Umweltökologie)

Session Classification: Biogeochemical cycling in grassland soils

Track Classification: Day 1: Science (English) / Tag 1: Wissenschaft (Englisch): Biogeochemical processes in grassland soils

Contribution ID: **33** Type: **Poster presentation (4:40 PM - 6:30 PM)**

Estimating vegetation traits in pre-Alpine grasslands by combining multi-annual of in-situ data and UAV Imagery

Tuesday 15 July 2025 16:40 (1h 50m)

Dear Editor,

I am pleased to submit an abstract for consideration of poster presentation in the International Grassland Conference 2025. The abstract is entitled "Estimating vegetation traits in pre-Alpine grasslands by combining multi-annual of in-situ data and UAV Imagery".
Thank you very much for your consideration.

Sincerely,
Batnyambuu

Primary author: Dr DASHPUREV, Batnyambuu (IMK-IFU - KIT)

Co-authors: KRÄMER, Alexander; SCHUCKNECHT, Anne; Dr PIATKA, David (IMK-IFU - KIT); Prof. BUTTERBACH-BAHL, Klaus (Dr.); KIESE, Ralf (IMK-IFU - KIT)

Presenter: Dr DASHPUREV, Batnyambuu (IMK-IFU - KIT)

Session Classification: Poster Session & Get-Together (including Beer & Pretzels)

Track Classification: Day 1: Science (English) / Tag 1: Wissenschaft (Englisch): Remote Sensing & Modelling

Contribution ID: **34** Contribution code: **3-RSM PM)** Type: **Oral presentation (9:10 AM - 4:10**

Satellite remote sensing for extensive analyses of grassland ecosystem functions in southern Germany

Tuesday 15 July 2025 13:55 (15 minutes)

Grasslands are widespread ecosystems that play a vital role in providing multiple ecosystem functions, particularly as sources of fodder. Despite their ecological and economic importance, knowledge about grasslands remains limited due to their high heterogeneity in use and management and, consequently, their species composition. This is particularly the case in regions such as southern Germany, where a wide variety of grassland types exists. Remote sensing offers significant potential for large-scale, consistent, and continuous monitoring of grassland characteristics. Within the SUSALPS project, various aspects of grassland ecosystems were investigated using Sentinel-2 (S2) satellite data. This research focused on analyzing mowing dynamics, yield, nitrogen content, and flower species richness of grasslands across multiple years. Mowing events were detected for the years 2018-2024 for entire Germany using high-resolution S2 time series and a rule-based thresholding method, achieving an average accuracy (F1-Score) of 0.65. Grassland biomass was estimated with S2 time series and in-situ measurements from 2019 to 2022 using an extreme gradient boosting algorithm, yielding an R^2 of 0.69. Grassland yield estimation was based on the estimated multi-temporal biomass and the mowing dates and conducted for the Ammer catchement area in southern Germany. Nitrogen content and species richness were estimated with a random forest approach also based on S2 time series, demonstrating promising results (R^2 = 0.79 and 0.56, respectively) for the SUSALPS study regions in the Ammer catchment area in southern Bavaria and the Rotmain-Weißmain catchment area in northern Bavaria. The resulting remote sensing-based products provide valuable insights into grassland dynamics and support both scientific modelling and decision-making processes for sustainable land management.

Primary author: Dr REINERMANN, Sophie (DLR DFD-LAX)

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Presenter: Dr REINERMANN, Sophie (DLR DFD-LAX)

Session Classification: Remote Sensing & Modelling

Track Classification: Day 1: Science (English) / Tag 1: Wissenschaft (Englisch): Remote Sensing & Modelling

Contribution ID: **35** Contribution code: **2-PMD PM)** Type: **Oral presentation (9:10 AM - 4:10**

Impact of organic fertilization on microbiomes along the trophic chain in grassland ecosystems

Tuesday 15 July 2025 11:25 (15 minutes)

Background: Agricultural grasslands are often managed intensively, influencing soil properties and local macro and micro- communities. The impacts of such anthropogenic changes are not limited to host diversity but can also affect diversity of host-associated microbial assemblages. These changes can have cascading effects across ecosystems, resulting in significant community alterations and challenges to health and function at different levels along the trophic chain.

Methods: This study investigates how fertilization affects microbial communities in grassland ecosystems in multiple connected trophic compartments treated with organic fertilizers, i.e. biogas digestate, cow/horse manure, and pig slurry, using high throughput 16S rRNA gene sequencing.

Results: Our results indicated shifts in microbial composition in response to fertilization, which were most pronounced in belowground trophic compartments. These changes were strongly host-dependent, with the pig slurry treatment exerting the greatest impact. The presence of overlapping bacterial genera across soil, plant, and animal compartments suggests strong interactions between trophic levels. Although pig slurry-derived microbes were detected in all compartments, their low prevalence indicates an indirect effect of fertilization, associated with changes in nutrient availability.

Conclusions: Our findings demonstrate that belowground and aboveground trophic levels respond differently to fertilization-induced microbial alterations. This highlights the importance of considering host-specific and trophic interactions when evaluating the impacts of anthropogenic disturbances on ecosystems and their implications for environmental and human health.

Primary authors: JETTER, Karoline (Universität Ulm); JANI, Kunal (Universität Ulm)

Co-authors: Prof. RIEDEL, Christian (Universität Ulm); WILHELM, Kerstin (Universität Ulm); Prof. WILFERT, Lena (Universität Ulm); Prof. SCHÄFER, Patrick (Justus-Liebig Universität Gießen); CHAMED-JEU, Rostand (Universität Ulm); Prof. SOMMER, Simone (Universität Ulm); STEHLE, Ulrike (Universität Ulm)

Presenter: JETTER, Karoline (Universität Ulm)

Session Classification: Plant & Microbial Biodiversity

Track Classification: Day 1: Science (English) / Tag 1: Wissenschaft (Englisch): Plant & Microbial Biodiversity

Contribution ID: **36** Contribution code: **4-SEC** Type: **Oral presentation (9:10 AM - 4:10 PM)**

New insights into carbon footprints of dairy farming in pre-alpine regions of Germany: The role of emissions from drained peatlands in milk production

Tuesday 15 July 2025 15:25 (15 minutes)

Greenhouse gas (GHG) emissions from agriculture significantly contribute to climate change, with drained peatlands representing a substantial and often overlooked source, especially in Germany where 95% are drained for agriculture. Existing life cycle assessments (LCAs) of milk production often underestimate environmental impacts by neglecting these soil emissions. This study quantified the influence of peatland-derived emissions on the carbon footprint (CF) of milk production from three dairy farms located on drained peatlands in pre-alpine Bavaria, Germany.
We calculated CFs with and without peatland emissions, applying three methodological approaches: IPCC Tier 1, Tiemeyer et al. (2020) implied emission factors (EFs), and Tiemeyer et al. (2020) water table-dependent (WTD) response functions. A calculated near-natural peatland reference scenario was also established to contextualize these emissions. Our findings show that peatland emissions are a highly significant contributor, increasing milk CFs by over double on average, and becoming the dominant emission source. The chosen methodology notably influenced calculated CFs, with WTD-dependent approaches yielding higher estimates. Although subtracting baseline emissions from a near-natural scenario resulted in a minimal CF reduction (3.95% to 8.29%), the substantial impact of drained peatlands remained robust.
This study underscores the crucial importance of explicitly including peatland emissions in dairy LCAs for accurate environmental assessment. Results highlight the urgent need for targeted mitigation strategies, particularly water table management, to reduce the climate impact of agriculture on drained peatlands.

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Presenter: MULLER, Anna-Lena (IMK-IFU - KIT)

Session Classification: Socioeconomy

Track Classification: Day 1: Science (English) / Tag 1: Wissenschaft (Englisch): Socioeconomy

Contribution ID: **37** Contribution code: **2-PMD PM)** Type: **Oral presentation (9:10 AM - 4:10**

Grazing for science - experiment on a species rich abandoned mountain pasture in the Oberammergauer alps and its impacts on biodiversity

Tuesday 15 July 2025 11:40 (15 minutes)

Over centuries mountain pasture has been a traditional way of agriculture in the alpine regions in Europe. This seasonal grazing led to species- and nutrient rich alpine grassland combined with human maintenance even below the tree line. Due to societal change and economic pressure within the last 50 years lots of those mountain pastures had been abandoned. So, the study area Brunnenkopfalm in the Oberammergauer Alps, Germany (1400-1700mm NN). Since early summer 2018 the around five ha pasture has been restocked yearly with five to seven Murnau-Werdenfelser cattle, which is a small frame local breed. After an initial monitoring before the regrazing we measured the floristic biodiversity and biomass. To determine the impact of the cattle on those parameters, five fenced control plots were installed on the pasture next to five unfenced plots where the cattle could graze on. The measurements were repeated each experimental year until 2025.
This study showed, that grazing increased the floristic evenness and decreased the plant cover and biomass on site. However, the measured regrowth effect indicates that grazing causes an overall increase in over the year grown biomass. This leads to the conclusion, that floristic biodiversity on alpine pastures benefits directly from grazing and therefore should be used as a tool for preserving valuable alpine grassland.

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Presenter: EHRMANN, Jonathan (Department of Disturbance Ecology and Vegetation Dynamics, University of Bayreuth, Germany)

Session Classification: Plant & Microbial Biodiversity

Track Classification: Day 1: Science (English) / Tag 1: Wissenschaft (Englisch): Plant & Microbial Biodiversity

Contribution ID: **38** Type: **Poster presentation (4:40 PM - 6:30 PM)**

Scaling Up the Multiple Values of Grasslands: Land-Use Scenarios for Europe

Tuesday 15 July 2025 16:40 (1h 50m)

Alpine and pre-Alpine grasslands represent ecologically rich and culturally important landscapes - shaped by long-standing human–nature interactions. By applying surveys in (pre-)Alpine Bavaria, we found that farmers and citizens not only attribute instrumental and intrinsic values, but predominantly relational values to grasslands. The results show that grasslands and their ecosystem services are valued for a variety of reasons on different locations, and point out the need for further investigations of of values associated with ecosystem services (Schmitt et al., 2022). Subsequently, by applying the Nature Futures Framework (NFF), we developed pathways that illustrate different trajectories toward achieving EU environmental and land-use policy goals based on the plurality of values (Raymond et al., under review). The (pre-)Alpine environment and grassland ecosystems are explicitly addressed across the scenario narratives: In Nature For Nature, extensive pastures and other semi-natural grasslands are not abandoned, but are maintained by free-roaming herbivores to prevent shrub and forest encroachment, sustaining vegetation structures vital for biodiversity. In Nature as Culture, traditional alpine grasslands are actively preserved as expressions of cultural heritage and identity, supported by strong community involvement in landscape stewardship. In Nature For Society, multifunctional grasslands are valued for their ecosystem services (e.g., flood retention and fodder production) and are integrated into land-use planning through sustainable intensification and agroecological strategies. By linking empirical insights from (pre-)Alpine grasslands with normative, value-based scenarios, this work illustrates how context-specific understandings of nature's values can inform systemic and future-oriented land-use strategies. It underscores the importance of embedding diverse human–nature relationships found in (pre-)Alpine grasslands in land-use modelling and policy to shape desirable and nature-positive futures for Europe.

Keywords: Scenarios, Relational Values, Cultural Landscapes, Policy, Europe

Authorship:
Schmitt, T.M.*, Riebl, R., Martín-López, B., Hänsel, M., Koellner, T., 2022. Plural valuation in space: Mapping values of grasslands and their ecosystem services. Ecosystems and People. https://doi.org/10.1080/26395916.2022.2

Raymond J., Schmitt, T.M.*, Tschol, M., Bakx, T., Brotons, L., Brown, Cl., Buitenwerf, R., Díaz-General, E., Ferreto, A., Kloibhofer, J., Laimer, T., Moreira, F., Pang, S., Plumanns-Pouton, E., Prestele, R., Smith, A., Svenning, J., Venancio, M., Rounsevell, M. Pathway narratives towards a nature-positive EU Land system: operationalizing the Nature Futures Framework for EU Policy objectives.

Primary author: Dr SCHMITT, Thomas (IMK-IFU - KIT)

Presenter: Dr SCHMITT, Thomas (IMK-IFU - KIT)

Session Classification: Poster Session & Get-Together (including Beer & Pretzels)

Track Classification: Day 1: Science (English) / Tag 1: Wissenschaft (Englisch): Socioeconomy

Contribution ID: **39** Contribution code: **1-BGC PM)** Type: **Oral presentation (9:10 AM - 4:10**

Nitrogen cycling processes in soil organic matter pools of grasslands as mediated by land use intensity and soil diversity

Tuesday 15 July 2025 09:40 (15 minutes)

Soil organic matter (SOM) provides crucial storage for carbon but also contains a majority of soil nitrogen. Land use intensity (LUI) may affect the particulate and mineral-associated SOM pools having repercussions on the carbon and nitrogen storage and cycling. Soil organic matter dynamics and composition plays a key role for the extent of these processes, yet its interactions remain poorly understood preventing targeted mitigation measures for carbon and nitrogen-related soil functions. Here we provide insights investigating how LUI and soil properties affect the storage of carbon and nitrogen in functional SOM pools in the topsoil (0-30 cm) of grassland soils across three different regions in Germany. Furthermore, we present a conceptual framework integrating biological, mineral, and organic nitrogen pools to disentangle nitrogen cycling processes and their interactions with organic matter dynamics.

Across the land use intensity gradient, we isolated particulate organic matter (POM), which is part of the >20 µm fraction, and mineral associated organic matter (MOM) in the <20 µm fraction. Random forest and mixed model analysis showed that LUI did not significantly affect SOM storage, but led to reduced C/N ratios in POM and MOM, driven by increased N fertilization intensity. Rather than land use intensity, soil properties, such as clay and iron oxide content, and soil type diversity exerted most influence on SOM.

To reconcile the influences of soil properties on soil nitrogen cycling, we provide a novel conceptual framework integrating organic matter stabilization mechanisms, microbial N uptake and release as necromass, as well important processes catalyzed by the soil microbiome including biological nitrogen fixation pathways. Our integrative nitrogen cycling framework stimulates different disciplines towards a new perception of the nitrogen cycle in unlocking multiple organic nitrogen pools as mediated by soil type and climatic conditions.

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Contribution ID: **40** Contribution code: **4-SEC** Type: **Oral presentation (9:10 AM - 4:10 PM)**

Mountain grasslands under pressure: Impacts of land use and climate changes on ecosystem services

Tuesday 15 July 2025 14:55 (30 minutes)

Mountain grasslands have been shaped by human activities over centuries, contributing to the provision of crucial ecosystem services to people living inside and outside mountain regions. However, mountain grasslands in the European Alps nowadays are facing significant transformations, mainly due to changes in the grassland management as well as climatic variations. Spatially explicit and quantitative analyses indicate that the abandonment or reduction of grazing and mowing activities generally results in lower levels of provisioning and cultural services at higher elevations. At lower elevations, the increased management intensity has focused on higher forage production, but the grassland area has been reduced due to urban sprawl or the conversion to annual or permanent cultures. Under future socio-economic scenarios, land-use changes tend to be less significant, while reforestation processes will continue to alter ecosystem services of former grassland areas in the long-term, amplifying the shift from typical grassland ecosystem services towards forest-related ecosystem services. In addition, the importance of climate change in driving changes in grassland ecosystems will increase, affecting particularly provisioning and cultural services and reducing management options. These findings emphasize the need for an adapted and more flexible management as well as for developing shared visions of appropriate and sustainable future pathways to maintain and enhance desired ecosystem services.

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Session Classification: Socioeconomy

Track Classification: Day 1: Science (English) / Tag 1: Wissenschaft (Englisch): Socioeconomy

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Keynote: Effects of different manure application techniques on the nitrogen balance of grassland

Tuesday 15 July 2025 09:10 (30 minutes)

Presenter: Dr DANNENMANN, Michael (IMK-IFU - KIT)

Session Classification: Biogeochemical cycling in grassland soils

Track Classification: Day 1: Science (English) / Tag 1: Wissenschaft (Englisch): Biogeochemical processes in grassland soils

Contribution ID: **42** Contribution code: **1-BGC PM)** Type: **Oral presentation (9:10 AM - 4:10**

TBD

Tuesday 15 July 2025 09:55 (15 minutes)

Presenter: Dr SCHLINGMANN, Marcus (LAZBW)

Session Classification: Biogeochemical cycling in grassland soils

Track Classification: Day 1: Science (English) / Tag 1: Wissenschaft (Englisch): Biogeochemical processes in grassland soils

Contribution ID: **43** Type: **not specified**

Welcoming

Tuesday 15 July 2025 09:00 (10 minutes)

Presenter: KIESE, Ralf (IMK-IFU - KIT)

Session Classification: Welcoming

Contribution ID: **44** Type: **not specified**

Ankunft & Registrierung/ Arrival & Registration

Wednesday 16 July 2025 08:00 (30 minutes)

Contribution ID: **45** Type: **not specified**

Busfahrt nach Graswang/ Bus trip to Graswang