LAMASUS
Land Management for Sustainability



Report on the Austrian Roadshow

Land-Use Changes and Alpine Agriculture

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1. Introduction

The LAMASUS (Land Use and Management Modelling for Sustainable Governance) project aims to develop methods and approaches to support better decision-making in land-use-related policies. Apart from scientific rigour and excellence, the project team aims to make research relevant for people and policymakers. The instruments to achieve this are a stakeholder board that is informed about findings regularly and whose members contribute to the development of scenarios that are analysed in a quantitative manner. A second instrument is a series of 'roadshows' that are organised to discuss the results of findings on case studies in various countries across Europe to obtain feedback from those who are likely to be affected by changes in land-use policies.

The Austrian roadshow took place on 9 February in Salzburg and was titled *"Land-use changes and Alpine agriculture"*. It was organised by the LAMASUS project partners WIFO, IIASA and BOKU. Its main objective was to present selected results of the LAMASUS project to Austrian stakeholders and to discuss their relevance for Alpine agriculture and land-use policy. In addition, the workshop aimed to reflect on the effectiveness of the project's methods of presenting results and to identify key challenges facing Alpine farming within the broader agricultural and environmental policy framework.

During the morning session, project partners presented the LAMASUS project, its methodology, data and key findings. The afternoon was dedicated to small-group discussions focusing on the Common Agricultural Policy (CAP), integrated rural development, and the role of agriculture in shaping Alpine regions. Participants worked on identifying strengths, weaknesses, opportunities, and challenges, fostering an open and constructive exchange between research and practice.

This paper is structured as follows: In the next section the participants of the roadshow are introduced. Furthermore, this section gives an impression of the participants' motivation to engage in activities that aim at the maintenance of a specific land use type in the Alps in Central Europe. In the third section, an overview is given of the presentations of the team of researchers that introduced the LAMASUS project and selected results. The reminder of the report presents the outcomes of an intensive discussion in four groups that focused on strengths, weaknesses, opportunities and threats of Alpine pastures and the reflections of the participants. The appendix contains supplementary materials such as the agenda, photos, and other materials.

2. Participants and their motives

The event brought together 19 stakeholders from different backgrounds, including representatives from agriculture, administration, research, and civil society. Of the 19

stakeholders participating in the roadshow, approximately 68% (13 participants) represented executive bodies of government or public administration, 53% (10 participants) identified as farmers, 21% (4 participants) were affiliated with interest groups, and 5% (1 participant) represented a research institute. It should be noted that several participants held multiple roles (e.g., farmer and representative of an interest group or public administration), meaning that these categories overlap and percentages do not sum to 100%. In total, five women were present at the event, including both stakeholders and researchers.

The roadshow began with an interactive opening question posed to all participants:

"Three reasons why Alpine farming in Europe is important."

Each participant was invited to spontaneously share three key arguments. This opening round immediately set up a collaborative tone and highlighted the diversity of perspectives in the room. The responses were visualized in a word cloud (Figure 2), summarizing the central themes mentioned by participants.



Figure 2: Word cloud of stakeholder responses on the importance of Alpine farming.

The word cloud highlights the multifunctional character of Alpine farming and Alpine pastures. Both elements 'farming' and 'Alpine pastures' are idiosyncratically linked together and cannot be separated because the maintenance of Alpine pastures depends on viable farms. Central concepts such as Sustainable Cooperation, Animal Welfare, Culture, Experience, and Recreation Area indicate that Alpine pastures are perceived not only as agricultural production sites but as socio-ecological systems that combine environmental, economic, and cultural functions. Overall, the visualization reflects a holistic understanding of Alpine agriculture.

3. LAMASUS: Project Presentation

The LAMASUS project was introduced as a Horizon Europe initiative aimed at supporting policy decisions from the EU level down to individual farms. The project analyses how current agricultural, climate, and land-use policies may unfold over the next 5, 10, or 20 years using an integrated modelling toolbox. Results are continuously refined with new data throughout the project duration (September 2022 to August 2026) and translated into policy-relevant formats such as policy briefs, workshops, and exchanges with public administration and practitioners. The consortium consists of 17 partners from seven countries and is supported by a Policy Advisory Board composed of representatives from major European institutions and research bodies.

The project structure links policy formulation, modelling, and monitoring in an iterative process, as illustrated in Figure 3. EU and national policy targets feed into macro-level and high-resolution models, including country-level, gridded, and behavioural models. These modelling outputs generate insights on future land-use and agricultural pathways and identify potential needs for action. At the same time, monitoring and evaluation systems at EU, national, and regional levels—drawing on land-use, carbon, biodiversity, and statistical datasets—continuously update and refine the models. This creates a feedback loop between policy design, model simulation, and empirical observation. Stakeholder involvement is embedded in this cycle to ensure that regional realities, behavioural aspects, and practical constraints are adequately reflected in scenario development. Regional roadshows in France, the Netherlands, Norway, and Austria serve as platforms to integrate case-specific feedback, with Alpine regions considered particularly important due to their environmental relevance and structural sensitivity to policy change.

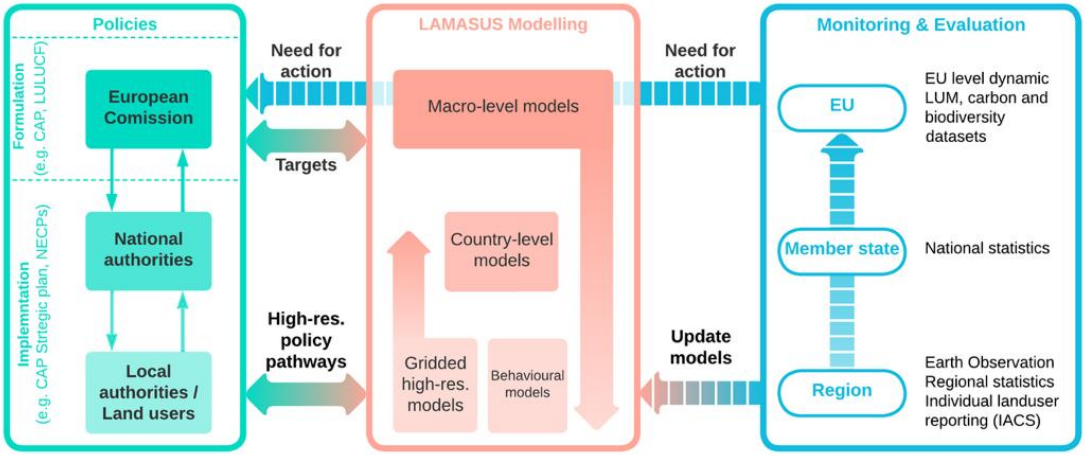


Figure 3: Policy–Modelling–Monitoring Interface within LAMASUS

The presentation led to an in-depth methodological discussion. Participants emphasized that the definition of 'extensive' farming should be clearly and explicitly specified to avoid misunderstandings in interpreting the results. Greater transparency regarding the criteria used in the modelling framework was recommended. It was also suggested that comparable mountain regions, such as the Pyrenees, could be examined to better contextualize the findings and to identify similarities and differences in management systems and data collection approaches. Further discussion addressed the concept of 'land use,' particularly in relation to the identification of fallow land. Participants highlighted the need to distinguish clearly between actual use, temporary non-use, and formal statistical classification. Changes in the statistical recording of Alpine forage areas were critically examined, with the remark that statistical adjustments do not necessarily correspond to real changes in management practices. The introduction of a new evaluation system in 2023 was noted as particularly relevant for data comparability over time. Finally, the distinction between geographical area and forage area was emphasized as essential for accurate interpretation, as both concepts reflect different dimensions of land management and productive capacity. Overall, the discussion underscored the importance of methodological clarity, transparent definitions, and careful interpretation of statistical changes within the modelling framework.

4. Alpine Pastures: Past, Present and Future Scenarios

4.1. PAST AND PRESENT

In the presentation *"Alpine Pastures in Transition – 2000 to 2024"*, presented by Sara Aref-Zahed, the long-term development of Alpine forage areas and Alpine farming systems in Austria was analysed using municipality-level data and multivariate regression models. The results indicate a substantial decline in Alpine forage area between 2000 and 2024 (–251,635

hectares; −43.8%), with the largest reductions occurring in core Alpine provinces such as Tyrol, Salzburg, Styria, and Carinthia.

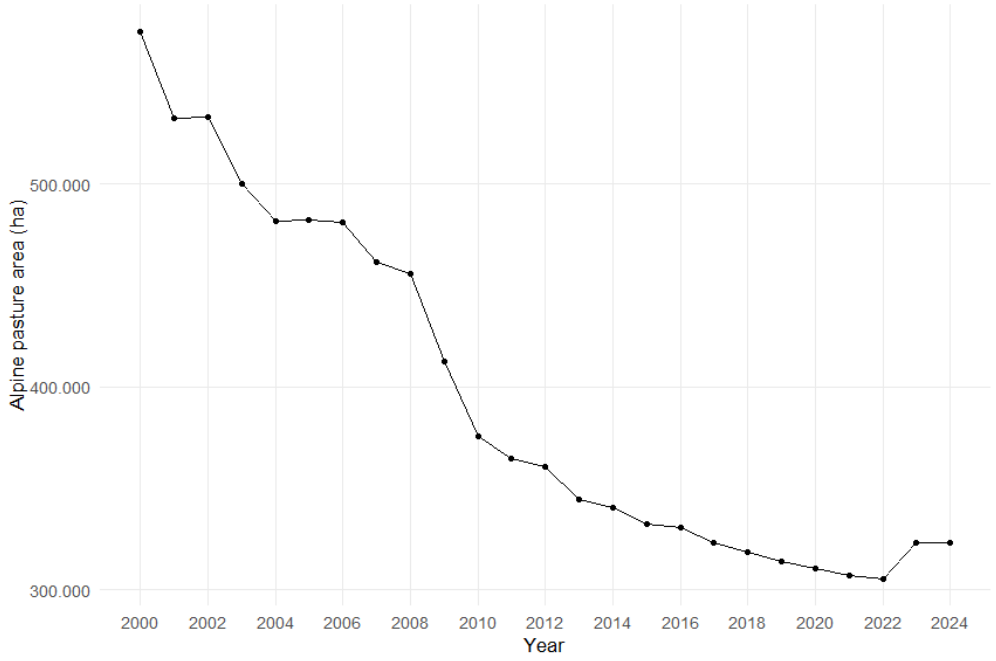


Figure 4: Alpine forage area in Austria, 2000–2024, showing a marked long-term decline with a slight recent increase.

During the discussion, stakeholders critically reflected the interpretation of these trends. They pointed out that the reported increase in 2023 is likely driven by changes in statistical classification and methodology rather than a real expansion of Alpine forage areas. It was also noted that the figures refer to gross area, while net area values might present a different picture. They suggested that the period 2010–2012 would constitute a more appropriate reference point than the year 2000. As an alternative, stakeholders proposed placing greater emphasis on livestock units (LSU – standardized livestock units), highlighting that the approximately 10% decline in livestock units also appears to be influenced by statistical reclassification.

The results of a regression analysis identify agricultural structure and demographic decline as key drivers of pasture loss, while higher participation in Measure 14 (site-adapted Alpine pasture management under the Austrian Agri-Environmental Programme) is associated with slightly lower losses. Beyond the statistical findings, stakeholders also addressed broader structural and contextual factors. These included the possibility that climate change may shift comparative advantages toward arable production in certain regions, as well as the expectation that Alpine farming systems may increasingly move toward mother cow systems in the future. Furthermore, questions were raised regarding the existence and segmentation of a distinct market for Alpine ("Alm") products, underscoring the importance of considering both structural dynamics and demand-side developments in assessing the future of Alpine farming.

4.2. FUTURE CLIMATE CHANGE SCENARIOS

The presentation *"Anpassung der österreichischen Landwirtschaft an den Klimawandel"* by Verena Kröner analysed how Austrian agriculture may adapt to four regionally downscaled climate change scenarios in the future (2031–2070) compared to a historical reference period (1981–2020). Conceptually, the analysis distinguished between three economic dimensions of climate change: vulnerability (impacts), adaptation (adjustments in production systems), and mitigation (emission reduction), emphasizing that adaptation and mitigation require decisions at multiple governance levels and may generate both trade-offs and synergies. Using an integrated modelling framework, model results, with efficient adaptation, suggest a decline in cropland and an increase in permanent grassland. Grassland biomass production increases due to longer vegetation periods associated with rising temperatures and, where available, sufficient water availability. The model results further indicate that the average nitrogen application in kg per hectare rises across all climate change scenarios. In contrast, direct nitrous oxide emissions from agricultural soils decline due to improved nitrogen use efficiency. The model results show that agricultural land with irrigation increases across all climate change scenarios, with the largest irrigated area under the dry climate change scenario, highlighting the relevance of irrigation as a central adaptation measure. Agricultural adaptation to climate change is heterogeneous across Austria, e.g., with cropland dominating in the East of Austria whereas permanent grassland and Alpine pastures are dominant in the Western parts of Austria. The model results show that efficient adaptation to climate change contributes to climate change mitigation.

During the discussion, stakeholders critically reflected several modelling assumptions and structural implications. The modelled increase in grassland area through cropland conversion was questioned, particularly the underlying assumption that irrigation supports grassland expansion. Several participants suggested adapting crop rotation systems within arable farming rather than converting cropland into grassland. For instance, stakeholders noted that in regions such as Salzburg, where grassland is historically dominating, structural change might instead lead to grassland being converted into cropland. Furthermore, stakeholders emphasized that ruminant production represents the central structural challenge and that adaptation should be analysed at the farm level. Stakeholders also pointed out that Alpine pasture areas (Almflächen) were insufficiently addressed, stressing that the key question is not only how forage grows under climate change, but also the purpose of livestock production, herd structure and green biomass use. Seasonal fluctuations in feed availability and livestock management were highlighted as crucial dimensions that are not fully captured in the integrated modelling framework. Overall, the discussion underscored the need to better integrate further dimensions, e.g., production systems, structural change, and market orientation into future climate change scenario assessments.

5. Data and Structural Insights

The presentation "*Project Results with Regard to Austria's Alpine Pastures – LAMASUS*" by Michael Wögerer provided an overview of the LAMASUS data infrastructure and its application to Austrian land use, with a particular focus on Alpine and grassland systems. Central to the analysis is a digital atlas of European land use and land-use change, combining annual Corine

Land Cover data, high-resolution satellite information, and harmonised EU statistics (Eurostat). The presentation highlighted challenges in interpreting grassland trends in Austria, noting that the observed strong decline in grassland is partly linked to changes in statistical data collection, but may also reflect actual abandonment of grazing landscapes. The importance of Alpine pastures for soil health and environmental performance was emphasized, alongside insights into livestock density patterns and greenhouse gas emissions under more sustainable management systems. Farm-level data from the EU Farm Accountancy Data Network (FADN) were presented as a key source for analysing economic performance and sustainable practices at the holding level.

During the discussion, stakeholders raised critical remarks regarding the interpretation of agricultural structural data. In particular, it was emphasized that the mere number of agricultural holdings does not provide meaningful information about the actual land area under management. A realistic assessment of agricultural structural change requires additional information on farm size and the distribution of land across holdings. Without considering area structure, conclusions about consolidation, intensification, or sustainability transitions may be misleading. This comment reinforced the broader discussion that structural change in Alpine and grassland regions must be analysed not only in terms of farm numbers, but also with regard to land concentration, livestock systems, and management intensity.

6. Alpine Land-Use and Governance

6.1. OUTLOOK ON THE REFORM OF THE COMMON AGRICULTURAL POLICY AFTER 2027

In his presentation *"Outlook on the Reform of the CAP after 2027"*, Franz Sinabell outlined the expected structural and governance changes in the future Common Agricultural Policy (CAP). The presentation highlighted shifts in budget allocation, new decision-making structures, and a changing weighting of priorities, particularly in relation to environmental and climate objectives. A key feature of the upcoming reform is the move away from the traditional ex-ante and SWOT-based programming logic toward a revised approach to program design. The new governance framework implies more complex coordination structures, especially in Austria, where multiple ministries and Federal States are involved. The logic of national CAP Strategic Plans was discussed, including the relationship between identified needs, priorities, and interventions, as well as the broader implications for rural development and environmental policy integration.

During the discussion, stakeholders linked the reform outlook to current structural developments in Alpine regions. It was noted that the decline in Alpine transhumance (Almauftrieb) is closely connected to the reduction in suckler cow numbers, indicating that livestock farming remains a decisive factor for Alpine pasture use. In addition, stakeholders expressed skepticism regarding the effectiveness of Alpine pasture as a marketing argument. While Alpine production is often associated with high environmental quality, its value as a distinct market label appears limited in practice. These comments underscored the

importance of aligning future CAP measures not only with environmental objectives but also with structural realities in livestock farming and with realistic assessments of market potential in Alpine regions.

6.2. WORLD CAFÉ: SWOT ANALYSIS ACROSS GOVERNANCE LEVELS

Following the presentations, participants engaged in a small-group discussion in a World Café format. The exercise was structured as a SWOT analysis, focusing on **s**trengths, **w**eaknesses, **o**pportunities, and **t**hreats or challenges related to Alpine agriculture and land use. Participants rotated between discussion tables, ensuring that each person contributed to every thematic group. This format allowed for cumulative reflection, as each group built on the ideas and arguments developed by previous participants.

In a second step, the points collected were systematically assigned to different governance levels. Using a matrix displayed on a flipchart (Figure 5), participants discussed whether the identified strengths, weaknesses, opportunities, and challenges primarily concerned the municipal (Kommune), regional/state (Land), national, or EU level, and whether they related more strongly to agriculture, tourism, environment, or other cross-cutting policy areas (Figure 6). This structured reclassification highlighted the multi-level nature of Alpine policy challenges and made visible how responsibilities and leverage points differ across governance levels.

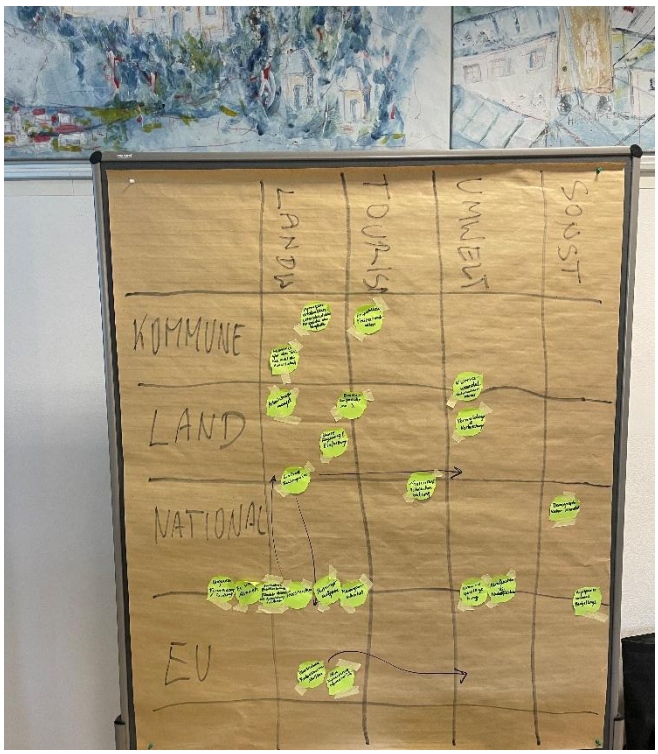


Figure 5: Allocation of identified risks across governance levels (municipal, regional/state, national, EU) during the World Café exercise.



Figure 6: Participants assigning identified risks to different governance levels during the World Café session.

Following the World Café exercise, each group presented its results in plenary. The presentations structured the discussion along the SWOT categories and across governance levels (municipal, regional/state, national, EU), revealing a high degree of differentiation but also strong interlinkages between levels.

Under **strengths**, participants emphasized high animal welfare standards, biodiversity, protection against natural hazards (erosion, avalanches, water retention), multifunctionality, and the strong societal and emotional value of Alpine farming. Tourism was repeatedly mentioned as a major co-beneficiary of Alpine landscapes, with Alpine pastures providing ecosystem services and recreational value that extend far beyond agriculture. However, it was also noted that many of these public goods are not sufficiently reflected in farm incomes. The concept of the "Brotkorb-Alm" (Alpine pasture as a key contributor to farm household income) illustrated that Alpine farming can significantly support farm households, yet this contribution often depends on public payments.

Under **weaknesses**, participants identified high production costs, lower yields, high labour intensity, bureaucratic burdens (particularly attributed to EU-level regulations), small-scale farm structures, and complex ownership and governance structures within agrarian communities. Conflicts between agricultural use and tourism were also highlighted, including unclear liability regulations and behavioural conflicts between visitors and farmers. Climate-related risks and large carnivores were discussed as environmental challenges shaped by EU-level legal frameworks but with strong local impacts.

The discussion of **opportunities** focused on strengthening animal welfare standards, ecosystem service payments, regional branding, water storage, biodiversity protection, and tourism-related value creation. However, scepticism was expressed regarding the effectiveness of Alpine branding as a standalone marketing strategy. Several participants stressed that maintaining Alpine pastures requires sufficient livestock numbers and strong home farms ("Heimbetriebe") that provide animals for summer grazing. Without viable home farms, Alpine management cannot be sustained.

Under **threats and challenges**, the most pressing concerns were uncertain future financing (particularly regarding CAP co-financing mechanisms), structural change, declining livestock numbers (especially suckler cows), labour shortages, rising investment costs, demographic change, and planning insecurity. Participants warned that changes in EU co-financing rules could substantially reduce available funds for agri-environmental measures (ÖPUL) and compensatory allowances, which are essential for mountain and Alpine farming. The decline in Alpine livestock numbers was repeatedly mentioned as a key structural threat, as sufficient grazing pressure is necessary to maintain open landscapes. Furthermore, increasing labour costs and difficulties in recruiting qualified Alpine personnel were seen as growing bottlenecks.

In the concluding reflections, it became clear that many of the identified challenges extend beyond classical agricultural policy. While the workshop focused on improving policy design, participants highlighted coordination problems between governance levels, conflicts between

user groups, and structural economic pressures that cannot be addressed by a single policy instrument alone. A central message emerging from the discussion was that Alpine farming provides a wide range of public goods—biodiversity, landscape maintenance, tourism value, cultural heritage, and climate-related services—yet these benefits are only partially remunerated. Strengthening Alpine farming therefore requires not only adequate funding instruments, but also better alignment between policy levels, stronger support for home farms, and targeted incentives to maintain livestock numbers and labour capacity.

The workshop concluded on a personal and symbolic note. After the formal discussion had ended, one participant began to sing a traditional Alpine song, creating a reflective and emotional closing moment. The spontaneous contribution underscored the strong cultural and emotional attachment participants have with Alpine farming and mountain landscapes.

This final gesture captured a recurring theme of the day: Alpine agriculture is not only an economic and environmental system, but also deeply embedded in regional identity, tradition, and collective memory. The song provided a powerful reminder that beyond policy frameworks, funding mechanisms, and structural challenges, Alpine farming remains a thriving cultural practice that resonates strongly with those connected to it.

7. Conclusion

The Austrian LAMASUS roadshow demonstrated the added value of linking scientific modelling with practical experience in Alpine regions. The project's integrated framework—connecting policy formulation, modelling, and monitoring—provides a strong analytical basis for understanding long-term land-use developments. At the same time, the discussions clearly showed that transparent definitions, careful interpretation of statistical changes, and clear communication of assumptions are essential to ensure credibility and acceptance among stakeholders.

Participants emphasized that the future of Alpine pastures depends not only on environmental conditions, but also on structural and economic realities. Viable farms that use livestock for grazing Alpine pastures, sufficient livestock numbers, stable financing mechanisms, and labour availability are decisive factors for maintaining Alpine management. The multifunctional character of Alpine farming—ranging from biodiversity and landscape protection to tourism, cultural heritage, and social cohesion—was repeatedly highlighted. However, many of these public goods are only partially reflected in farm incomes, underlining the need for coherent and well-coordinated policy support across governance levels.

A key message emerging from the workshop was the importance of sustained dialogue between science and practitioners with hands-on experience. Quantitative models can identify trends and simulate scenarios, but they must be continuously confronted with the practical knowledge of farmers, regional authorities, and other local actors. Such an exchange helps refine modelling assumptions, reveal blind spots, and ensure that policy recommendations are grounded in real-world conditions. The roadshow illustrated that meaningful land-use governance in Alpine regions requires not only robust analytical tools, but also strong and continuous interaction between research and practice.

8. Annex

All documents in the Annex were shared in advance to the workshop with the stakeholders in German.

8.1. INFORMATION AND AGENDA

Workshop

Landnutzungsänderungen und alpine Landwirtschaft

Ort:	Heffterhof, Maria-Cebotari-Straße 1–7, 5020 Salzburg
Datum:	9. Februar 2026
Zeit:	10:30 Uhr bis 17:00 Uhr
Ziele:	Präsentation ausgewählter Ergebnisse des Projekts LAMASUS
	Effektivität der Methoden der Ergebnisdarstellung von LAMASUS
	Kernelemente der Herausforderungen der Alpinen Landwirtschaft
	Artikulation von Argumenten im agrar- und umweltpolitischen Prozess

LAMASUS - Landbewirtschaftung für Nachhaltigkeit

LAMASUS entwickelt ein innovatives Governance-Modell, das auf der Zusammenarbeit von politischen Entscheidungsträger:innen, Landnutzer:innen und Forscher:innen basiert. LAMASUS erstellt eine frei zugängliche Modellierungs-Toolbox, um im Rahmen des Europäischen Grünen Deals eine solide Landnutzungspolitik zu entwickeln.

LAMASUS ist ein Projekt im Rahmen von „Horizont Europa“, das darauf abzielt, das Klimaneutralitätsziel der Europäischen Union zu erreichen. Wir entwickeln ein innovatives Modellierungssystem, mit dem sich die potenziellen Auswirkungen verschiedener Agrar- und Forstpolitiken vorhersagen lassen. Mithilfe unserer Tools können politische Entscheidungsträger die wirtschaftlichen und ökologischen Vorteile verschiedener Politiken mittel- und langfristig bewerten. Dies trägt zu einer fundierteren Entscheidungsfindung und einer nachhaltigeren Zukunft bei.

Agenda

10:30 – 11:15	Eröffnung, Begrüßung und Ziele des Workshops, Vorstellung Teilnehmer:innen Franz Sinabell, WIFO

Je 12min Präsentation, gefolgt von 5min Diskussion und überschüssige Zeit fungiert als Puffer:

11:15 – 11:32	LAMASUS Projektvorstellung Tamás Krisztin, IIASA
11:32 – 11:49	Landnutzungsänderungen in der Vergangenheit Sara Aref-Zahed, WIFO
11:49 – 12:06	Erwartete Landnutzungsänderungen Verena Kröner, BOKU
12:06 – 12:23	LAMASUS Zwischenbilanz Michael Wögerer, IIASA
12:30 – 13:30	Mittagspause
13:30 – 13:47	Impuls zur aktuellen Reform der Gemeinsamen Agrarpolitik sowie zur integrierten ländlichen Entwicklung und der Beitrag der Landwirtschaft Franz Sinabell, WIFO
13:47 – 15:00	Kleingruppen-Diskussion in einem Weltcafé-Format • Stärken • Schwächen • Chancen • Herausforderungen
15:00 – 15:30	Pause
15:30 – 16:30	Resümee der Kleingruppen-Diskussion Tamás Krisztin, IIASA; Sara Aref-Zahed, WIFO; Verena Kröner, BOKU; Michael Wögerer, IIASA
16:30 – 17:00	Abschied und Ausklang Franz Sinabell, WIFO; Tamás Krisztin, IIASA

8.2. ALPINE PASTURES: PAST & PRESENT



Alpine Pastures: Past & Present

Sara Aref-Zahed[a, 1], Dietmar Weinberger[a, 2], Franz Sinabell[a, 3]

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WIFO AUSTRIAN INSTITUTE OF ECONOMIC RESEARCH

1. Motivation

1.1 Why Alpine pastures matter



Figure 1: Traditional Alpine pasture as part of the Austrian mountain landscape; Source: Pexels

Alpine pastures (*Almen*) are a defining feature of Austria's mountain landscapes. Over centuries, seasonal grazing, local knowledge transmission, and adaptation to challenging environmental conditions have shaped these systems and contributed to their cultural significance. In 2023, transhumance (the seasonal movement of livestock) was inscribed on UNESCO's Representative List of the Intangible Cultural Heritage of Humanity, highlighting Alpine pastoralism as a living cultural practice of outstanding value (UNESCO, 2023).

Beyond their cultural role, those *Almen* provide important environmental benefits. Extensive grazing helps maintain open landscapes, slows shrub encroachment, and supports high levels of plant and insect diversity. Alpine grasslands contribute to habitat heterogeneity, soil protection, and the regulation of water runoff, particularly in steep mountain terrain. Their contribution to maintaining semi-natural mountain landscapes makes them especially relevant for biodiversity conservation in the European Alps (Bätzing, 2015). However, environmental outcomes depend strongly on grazing intensity and continuity of use. Excessive grazing pressure can lead to soil compaction, vegetation damage, and increased erosion risk, especially on steeper slopes (e.g., Centeri, 2022). This highlights that environmental benefits are not automatic but depend on appropriate management.

In addition, Alpine pastures are an important component of regional economies. They support livestock farming, enhance Alpine tourism by maintaining attractive cultural landscapes (and infrastructure), and contribute to regional agricultural value chains. At the same time, Alpine pasture systems are economically vulnerable, particularly in the

context of demographic change, structural transformation in agriculture, and shifts in policy frameworks (Flury et al., 2013).

1.2 Historical developments: 1920 to 2020

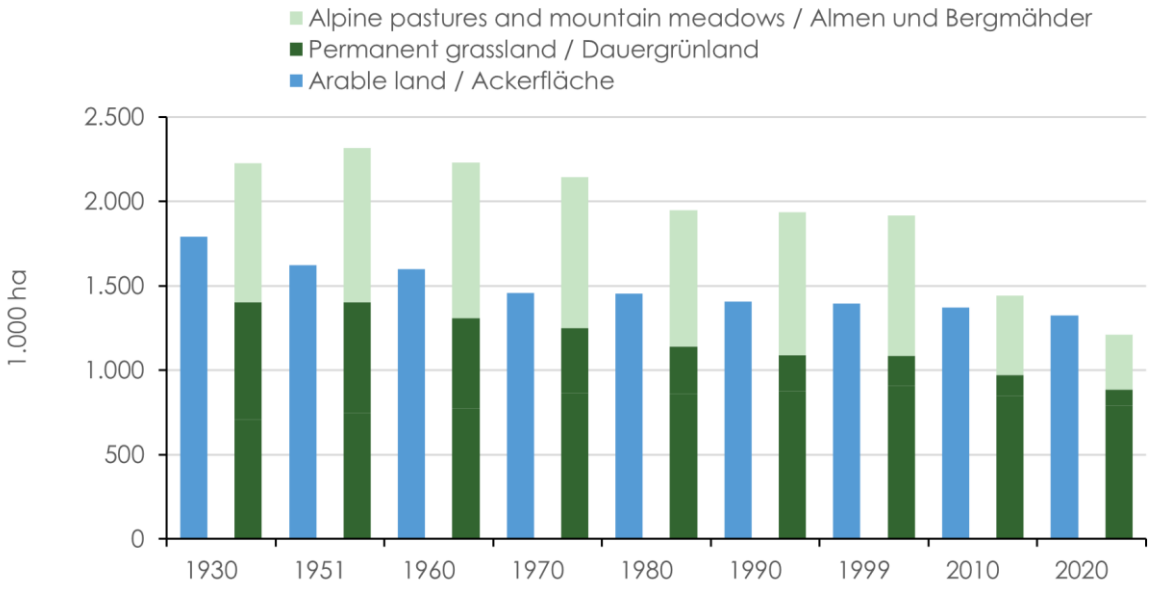


Figure 2: Development of arable and grassland area and arable land per capita; Source: Sinabell & Renhart, 2024)

Figure 2 shows the long-term development of Alpine pastures and mountain meadows in Austria from 1920 to 2020.

Over the entire period, Alpine pastures have declined continuously and substantially. While the total agricultural area has changed in different ways across land-use types, Alpine pastures stand out as one of the categories with the most persistent long-term losses. Unlike intensively managed permanent grassland, which expanded, Alpine pastures did not benefit from structural intensification and steadily lost area.

The figure therefore highlights that the recent contraction of Alpine pastures is part of a decades-long transformation, not a short-term or cyclical development.

1.3 Recent developments: 2020 – 2024

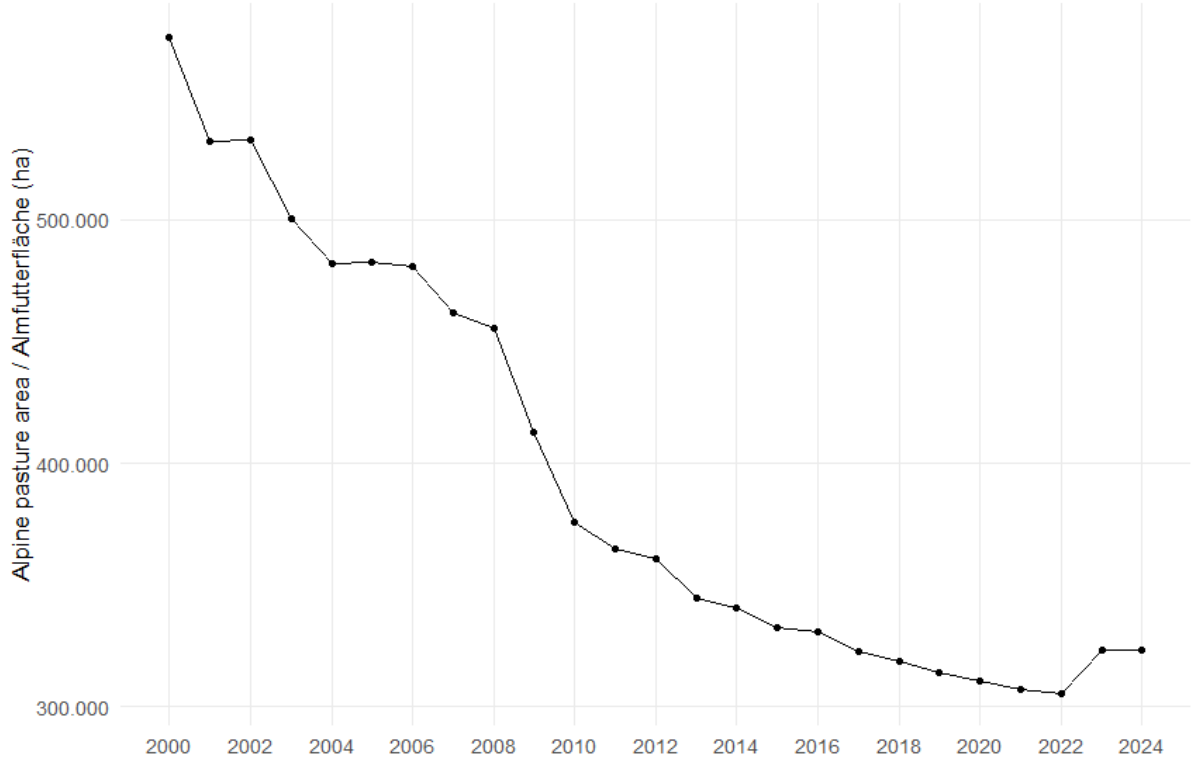


Figure 3: Alpine pasture area in Austria by year at the municipal level; Source: WIFO analysis

Focusing on the period since 2000 shows that the decline of Alpine pastures has continued into recent decades. In the early 2000s, the Alpine pasture area decreased relatively quickly. Around the end of that decade, the pace of decline slowed, but the overall trend remained negative.

The timing of this slowdown coincides with increased political attention to mountain farming and the introduction of targeted support measures under national and EU agricultural policies, particularly payments for areas with natural constraints and agri-environmental schemes (European Parliament & Council of the European Union, 2013; BMNT, 2018). However, the data indicate that these measures have not reversed the long-term trend. Instead, they appear to have moderated ongoing losses within a broader structural decline.

Looking at recent developments, therefore, reinforces the long-term perspective: current policies may influence how fast Alpine pastures are lost, but they have not fundamentally altered the trajectory shaped by decades of structural change.

1.4 Where Alpine pastures still matter

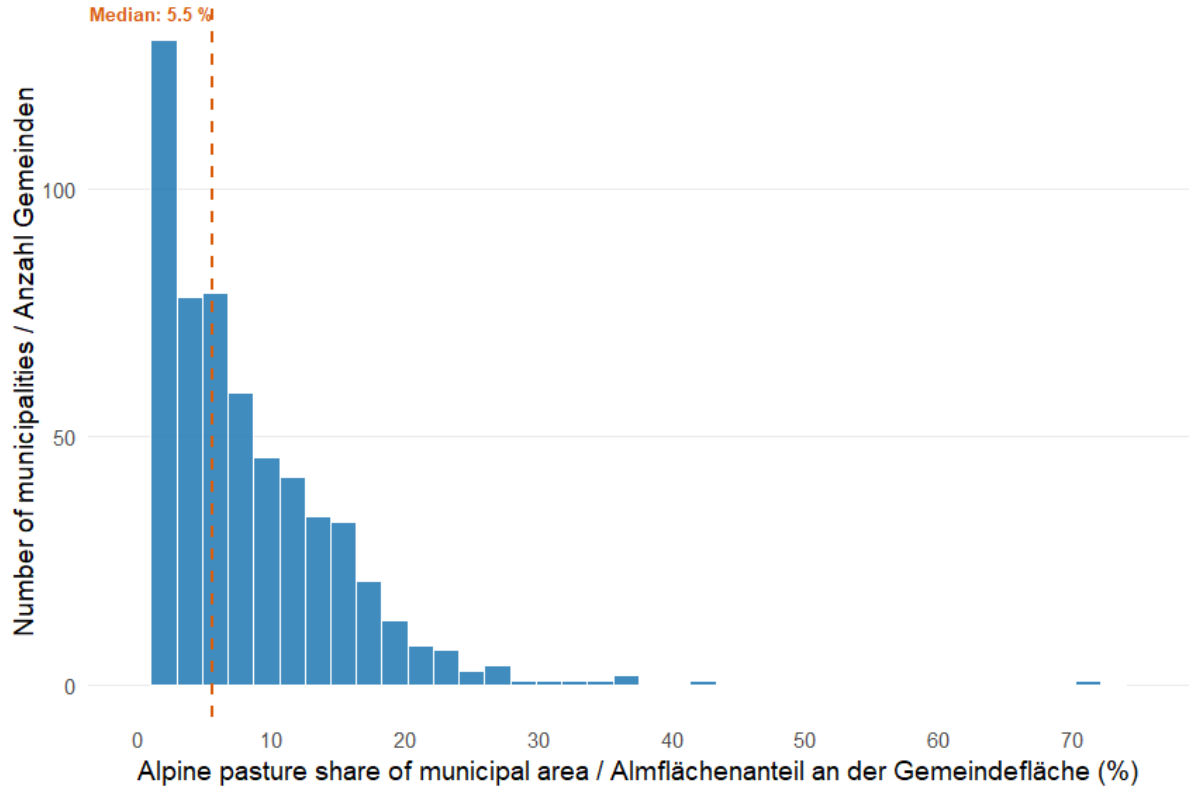


Figure 4: Distribution of the share of Alpine pasture area across municipalities in Austria (2024); Source: WIFO analysis

The distribution of Alpine pastures across Austria is highly uneven. While Alpine pastures are often perceived as a typical feature of mountain regions, they play only a minor role in most municipalities. In many cases, Alpine pasture area accounts for just a small share of total municipal land.

At the same time, a relatively small number of municipalities still have a high proportion of Alpine pastures. These areas concentrate a large share of the remaining Alpine pasture land and carry most of the responsibility for maintaining Alpine grazing systems. This spatial concentration means that changes in Alpine pasture management have very different implications depending on location.

As a result, the decline of Alpine pastures is not a uniform national issue but a regionally specific one. In municipalities where Alpine pastures still matter, their loss has far-reaching consequences for land use, landscape character, and farming practices. In many other areas, however, Alpine pastures have already become marginal or have disappeared entirely.

2. Research Questions

Building on the motivation outlined above, the analysis focuses on three central questions:

- How has the area of Alpine pastures in Austria changed over the long term, and how do recent developments compare to historical trends?
- How unevenly are Alpine pastures distributed across municipalities, and where do they still play a significant role today?
- How do demography and participation in agri-environmental measures differ across regions?

3. Methods

The analysis uses official Austrian time series data from the GEDABA database (Federal Ministry of Agriculture, Forestry, Regions and Water Management, 2024). We work with annual data at municipality level and, where relevant, district level. Key variables include Alpine pasture area (ha), the number of Alpine pastures, grazing animals on Alpine pastures (cattle, sheep, goats, and horses) and their aggregate measure in livestock units (GVE), as well as utilized agricultural area with and without Alpine pastures (ha). Municipality area (km²) and population are used to derive comparable indicators across regions.

We compile GEDABA indicator tables into a panel dataset by municipality/district and year, and we calculate cross-sectional indicators for the latest available year (currently 2024). These include: the share of Alpine pasture area in total municipal area, grazing intensity (GVE per hectare of Alpine pasture), the share of utilized agricultural area linked to Alpine pastures, and participation in agri-environmental measures. In particular, we use the area under "site-adapted Alpine pasture management" (ÖPUL Measure 14) and express it as a share of Alpine pasture area. Missing values in Alpine-related variables are treated as zero where appropriate.

The empirical work combines descriptive statistics and visualizations (time series, distributions, and bivariate plots) with regression models. We estimate (i) a logistic model for whether a municipality has any Alpine pasture activity, (ii) linear models explaining the municipal share of Alpine pasture area among municipalities with Alpine pastures, and (iii) linear models explaining changes in Alpine pasture area between 2000 and 2024. Explanatory variables include population density, the share of agricultural land linked to Alpine pastures, participation shares in agri-environmental measures, and federal state fixed effects. Additional models relate changes in Alpine pasture area to demographic change (percentage population change between 2001 and 2024). Results are interpreted as statistical relationships in the data rather than strict causal effects.

4. Results

4.1 How much Alpine pasture area do municipalities have in 2024?

Looking only at municipalities that still have Alpine pastures, we model what explains why some municipalities have a larger share of Alpine pasture land than others. The model explains a fairly large part of the differences between municipalities (about 45%).

Main patterns:

- Municipalities with a larger share of land under ÖPUL measure 1081 (relative to their Alpine pasture area) tend to have a higher Alpine-pasture share overall.
- Municipalities where a larger share of their Alpine pastures is covered by "site-adapted Alpine pasture management" (ÖPUL measure 14) tend to have a smaller Alpine-pasture share.
- There are also clear regional differences between federal states, even after accounting for the factors above.

4.2 Who loses Alpine pasture area? Change between 2000 and 2024

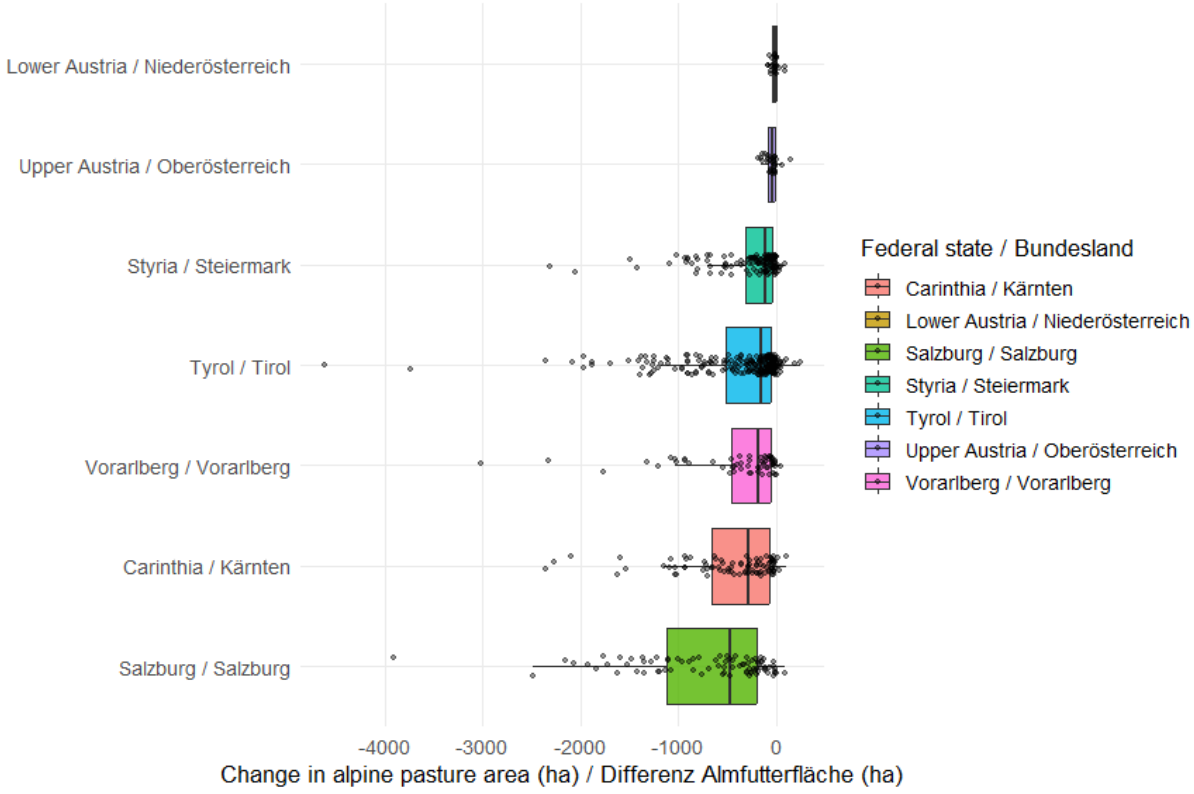


Figure 5: Change in Alpine pasture area between 2000 and 2024 by federal state; Source: WIFO analysis

Comparing Alpine pasture area in 2000 vs. 2024 at the municipality level shows that the decline is widespread (only municipalities with valid values in both years are included).

Overall, most municipalities lost Alpine pasture area:

- The typical (median) change is about −158 hectares.
- The average (mean) change is about −386 hectares.
- Losses can be very large (down to about −4,609 ha), while gains are much smaller (up to about +255 ha).

When grouping municipalities by the size of change:

- Strong decline (more than −50 ha): 464 municipalities
- Slight decline (−50 to −10 ha): 100 municipalities
- Relatively stable (−10 to +10 ha): 57 municipalities
- Increase (more than +10 ha): 28 municipalities

The decline in Alpine pasture area therefore clearly dominates, while increases are rare.

The largest absolute losses of Alpine pasture area occur primarily in high-Alpine municipalities with ecologically particularly valuable Alpine grazing areas. These include, among others, municipalities in the Hohe Tauern and the Central Alps such as *St. Jakob in Defereggen*, *Matrei in Osttirol*, *Prägraten am Großvenediger, Rauris*, *Fusch an der Großglocknerstraße*, and *Malta*.

In these regions, Alpine pastures are extensive, traditionally managed, and closely linked to species-rich high-elevation ecosystems. Corresponding losses of pasture area therefore imply not only a decline in agricultural use, but also the loss of ecologically and landscape-wise highly sensitive areas.

4.3 What is associated with larger losses vs. smaller losses?

A regression model suggests:

- Municipalities where Alpine pastures are more closely tied to the overall agricultural land-use system tend to have larger absolute losses in Alpine pasture area.
- Higher population density is linked to slightly smaller losses (this effect is small and only borderline significant).
- A higher coverage of site-adapted Alpine pasture management (ÖPUL 14) is linked to less severe decline.
- Differences between federal states remain important.

4.4 Demographic change and Alpine pasture decline (2001–2024)



Figure 6: Population change and change in Alpine pasture area at municipality level (2001–2024); Source: WIFO analysis

Figure 6 shows the relationship between population change and changes in Alpine pasture area at the municipality level between 2001 and 2024. The figure includes 649 municipalities with valid data for both population and Alpine pasture area.

Each point represents one municipality. The horizontal axis shows population change, while the vertical axis shows the change in Alpine pasture area. The dashed lines divide the figure into four quadrants, distinguishing municipalities with population growth or decline and increasing or decreasing Alpine pasture area.

Overall, municipalities with population growth tend to experience smaller losses of Alpine pasture area, while municipalities with population decline more often show larger losses. The fitted trend line indicates a positive association between population change and Alpine pasture change, although substantial variation remains across municipalities and regions.

When linking Alpine pasture change with population development, one consistent pattern emerges:

- Municipalities with population growth tend to have smaller losses of Alpine pasture area.

- Municipalities with population decline tend to have larger losses.

In the model excluding Vienna, population change is a significant predictor:

- Roughly +4.4 hectares more Alpine pasture area change (i.e., *less loss*) for each +1 percentage point of population change (2001–2024).

5. Policy recommendations



Figure 7: Alpine pastures as part of an interconnected socio-ecological system; Source: ChatGPT

The analysis shows that the decline of Alpine pastures in Austria is long-term, regionally concentrated, and closely linked to structural and demographic factors rather than short-term management decisions. Policy responses therefore need to be realistic about what can be influenced by agricultural policy and where broader rural development strategies are required. Based on the findings, four main policy directions emerge.

5.1 Focus support on regions where Alpine pastures still play a central role

Alpine pastures are increasingly concentrated in a limited number of municipalities. In many areas, they have already become marginal or have disappeared entirely. Policies aiming to maintain Alpine pastures should therefore be spatially targeted. Rather than applying uniform national measures, support should prioritize municipalities where Alpine pastures still make up a substantial share of land use and where their loss would

have the greatest ecological, cultural, and landscape impacts. Concentrating resources in these regions increases the likelihood that policy measures have a tangible effect.

5.2 Strengthen long-term viability rather than short-term stabilization

The results suggest that existing support measures may slow down losses but do not reverse the long-term decline. This indicates that policies focused solely on maintaining current use levels are insufficient. Greater emphasis should be placed on improving the long-term viability of Alpine pasture management, including labour availability, succession, and income stability. Measures that reduce administrative burden, support cooperation between farms, or link Alpine pasture use more strongly to regional value chains (e.g. tourism) are likely to be more effective than short-term compensatory payments alone.

5.3 Integrate Alpine pastures into broader rural and demographic policy

Population change emerges as a consistent factor associated with Alpine pasture decline. Municipalities with population loss tend to experience stronger reductions in Alpine pasture area. This highlights that Alpine pasture management cannot be addressed by agricultural policy alone. Policies supporting rural infrastructure, services, and living conditions are indirectly but critically linked to the future of Alpine pastures. Coordinating agricultural measures with regional development, mobility, and housing policies can help address the structural conditions that underpin land abandonment in mountain regions.

5.4 Use agri-environmental measures strategically, not uniformly

Participation in site-adapted Alpine pasture management is associated with less severe decline, but it does not appear to be a universal solution. This suggests that agri-environmental measures are most effective when they are well aligned with local conditions and embedded in broader land-use strategies. Rather than expanding participation indiscriminately, policies should focus on improving the design, flexibility, and regional fit of such measures, ensuring they support viable management systems where Alpine pastures still play an active role.

5.5 Accept structural limits and plan for differentiated outcomes

Finally, the long-term and uneven nature of Alpine pasture decline implies that not all losses can or should be prevented. In some regions, structural conditions may no longer support continued Alpine pasture use. Policy should therefore distinguish between areas where maintenance is realistic and desirable, and areas where alternative land-use trajectories (e.g. natural succession, forest development) may be more appropriate. Making these distinctions explicit can help avoid unrealistic expectations and support more transparent and effective land-use planning.

Taken together, the findings suggest that maintaining Alpine pastures requires a combination of targeted agricultural support, integrated rural development, and realistic recognition of long-term structural change. Policies that acknowledge this complexity are more likely to sustain Alpine pastures where they still matter most.

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