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# MOUNTAIN AGRICULTURE AND MOUNTAIN FORESTRY WORKING GROUP MANDATE 2023-2024 FINAL REPORT

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*Towards agricultural and forest management in line with  
the ecological transition of Alpine areas*

**Mountain Agriculture and Mountain Forestry  
Working Group of the Alpine Convention**

*Mandate 2023-2024*



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## IMPRINT

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## Executive summary

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In the 2023-24 mandate, the Mountain Agriculture and Mountain Forestry (MAMF) Working Group considered to focus its activities on some aspects crucial for maintaining the vitality of Alpine communities, including acceptable working and living conditions, comparable to those of more populated areas.

The focus of the carried out activities focused on the following themes:

- the depopulation of many Alpine areas, which is the cause of abandonment of agricultural and forestry activities: analysis of the causes and possible counteractions;
- the importance of innovating production and management processes in agricultural and forestry contexts, both in the private sector and at a supra-corporate (public) level, also for stimulating associative and cooperative actions ;
- the implementation of circular economies in the Alpine territories;
- the multifunctional role that mountain agriculture and forestry exerts and enables on other economic activities (hospitality, tourism and well-being, craftsmanship) in the Alpine context.

These are interrelated topics and their importance is also reflected in the effectiveness of possible actions to preserve biodiversity and to combat and adapt to climate change in the Alpine Territories.

Regarding depopulation of mountain areas, the situations found along the Alpine arc are not homogeneous because demography and the trend of the local economy are closely related. There is a correlation between the development of agricultural and forestry holdings (mostly small family farms) and the overall demographic trends. An important problem connected to depopulation concerns the problematic management of the forest stands, for which the lack of a precise reference to the owners of the plots (that could be dead or emigrated decades ago) often prevents the coordination of targeted actions to contain diseases and insect attacks.

Facing the problem of depopulation, the institutional and political approach must necessarily act on multiple levels to guarantee to local people a good level of essential services (mobility, school, health services) and quality of life (environment, biodiversity, sense of community, cultural activities and exchanges, etc.), as well as good income and job opportunities. An important suggestion concerns the need for farmers and foresters to acquire greater contractual power by organizing themselves into producer associations and processing and marketing cooperatives working in the local value chains. The intermediation of forestry associations and consortia between private owners, local administrations, and research institutions is instead fundamental for more effective management of forests to safeguard the forest heritage of the Alps. Finally, since tourism, handicraft, agriculture, and forestry can positively influence each other, a proper target could be to build a network of relationships allowing the different operators (including hoteliers, restaurateurs, and culture and well-being operators) to offer products and services that complement each other, implementing a district-type economic model.

The introduction of new technologies (so-called “smart”, ICT or "Agriculture 4.0", Smart Forestry) in mountain environments can significantly improve both working conditions (thanks to process automation and remote monitoring of infrastructures) and decision support (thanks to the collection and processing of climate and environmental data, or information from the implemented processes). Collecting data through satellites or drones also allows for more effective monitoring and management (thanks to public-private interaction) of larger areas and the possibility of creating maps of mountain territories subject to specific problems (phytosanitary, drought, fires, etc.). The possibility of introducing these innovations within small Alpine properties (farms or forests) can be favoured by good skills and a good level of education among farmers, but there is the need of stimulating the presence of companies or consortium structures able to offer services based on new and advanced technologies at affordable costs for family land properties. These technologies undoubtedly represent a great opportunity for improvement in monitoring and managing entire portions of Alpine territory by public administrators and political decision-makers.

In the coming decades, the EU will require member countries to use production models with a lower environmental impact, less extraction of natural resources from the environment, less waste, and less pollution : in this respect, it is crucial the implementation of different forms of circular economy.

One of the topics discussed in the mandate was, therefore, the verification of possible paths of circular economy to reuse waste or by-products of production processes which, if disposed as they are, represent an increase in costs for manufacturing companies and potential pollution for the environment. Many studies highlight that different forms of circular economy can be introduced in Alpine agricultural and forestry farms, starting with the use of by-products from the wood industry to the use of food waste from fruit and vegetable processing chains or the exploitation of natural plant species (mainly conifers) to obtain semi-finished products with a broad spectrum of uses (also with nutraceutical and farmaceutical properties). Some projects discussed are already in the implementation phase, and others are still in the study and experimentation phase. Empirical evidence highlights that concrete possibilities for implementing forms of circular economy also exist within small and medium-sized companies operating in the Alpine region, representing a new way to diversify production activities and sources of income for small family businesses. It is therefore recommended that research projects capable of valorising waste and by-products from Alpine value chains continue to be financed.

The last topic the working group focused on is the declination of the multifunctionality concept of agriculture and forestry in the Alpine environment, manifested through a series of positive externalities combined with the production of food and wood. Multifunctionality can be identified with:

- a series of very varied ecosystem services, such as: the protection of forests and animal and plant biodiversity in Alpine ecological systems; the maintenance and care

of the landscape and pastures; the protection of water and air quality; the fight against the effects of climate change; carbon storage; fire control

- the maintenance of typical traditional productions (cheeses, cured meats, cereals, baked goods, handycraft)
- the protection of social, cultural, and identity values in which Alpine populations recognize themselves.

This series of non-market outputs (which, therefore, do not find direct remuneration from the beneficiaries) are guaranteed by the presence of agricultural and forestry activities often conducted by small family farms according to methods well consolidated over time, which can be improved by the introduction of technological innovations, but still requiring attention and respect for traditions.

It is recommended that local administrators and political decision-makers at various levels do not neglect this group of small and medium-small agricultural and forestry businesses often organized on a family basis in terms of policies, funding, and aid as these, with their production and activities, can guarantee those externalities that are the basis of the attractiveness of the Alpine territories, both for tourist flows and for local populations and young people.

## 1. THE OBJECTIVES OF THE MANDATE 2023-24 OF MAMF WORKING GROUP

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The activity carried out by the Mountain Agriculture and Mountain Forestry Working Group during the Mandate 2023-2024 focused on different themes, on which the activities organized by the Working Group were focused.

The 2023-2024 mandate outlined four different objectives, reported below:

**Objective 1** – *Define the future role of mountain agriculture in sustainable food systems, considering also livestock that, on one hand is connected to the rich and specific biodiversity, landscape quality and cultural heritages (“Alpage”), while, on the other hand can be a pressure and it is subject to climate risks.*

**Objective 2** - *Understand new opportunities for mountain territories in terms of: agricultural and forestry productions and management approaches that favour or are already in line with ecological transition and circular economies; sustainable agricultural and forestry productions that allow to recover abandoned areas; initiation and development of Alpine districts.*

**Objective 3** - *Understand which physical (e.g. climate change), social (e.g. abandonment, loss of knowledge) or demographic (e.g. depopulation, ageing) risks threaten mountain agriculture and forestry and related actions to be implemented.*

**Objective 4** – *Evaluate the introduction of technical (e.g. low-impact management techniques) and technological innovations (e.g. smart farming/forestry and precision farming/forestry) in small and medium sized farms and forest activities targeting a good balance of innovations and traditional practices, an efficient use of inputs and favouring reduction of greenhouse gases (GHG) emissions or increase in GHG sink.*

The first objective is closely linked to the theme of the multifunctionality of agriculture and forestry, an aspect that becomes even more important in the Alpine regions, where primary production activities bring positive results not only in economic terms but also in environmental and socio-cultural ones. The second objective underlines the need for Alpine agriculture and forestry to approach production models oriented towards ecological transition, underlining the importance of creating forms of circular economy that allow the valorisation of waste or by-products of production activities, removing them from the costly processes of disposal as waste and obtaining from them new productions and greater value from the supply chain. The third objective is connected to the now long-standing phenomena of depopulation of the mountains, which result in the abandonment of lands devoted to mountain agriculture or forestry. The negative consequences are numerous, not only in terms of production but also in terms of changes in the landscape and possible damages resulting from the lack of maintenance of the forest heritage and of works such as drystone walls and terraces. Finally, the last objective considers the possibilities offered by new technologies applicable on different scales (farm/forest, local, regional) to improve decision-making processes and management choices when faced with various types of management problems affecting crops, forests, or livestock activities.

These four objectives are strongly interlinked and cover various aspects (economic, social, technological, and climatic) of the Alpine territories and their local communities. The Working Group identified them as themes to be developed because they contribute to highlight both the strengths of closely interlinked economic activities in the Alps (agriculture, forestry, craft industry and tourism), and the weaknesses that have emerged in these territories over the decades. These are important issues that policymakers will have to consider to make every effort to counter negative trends and identify possible ways of developing and increasing Alpine economic activities, to encourage the retention and generational change of resident populations.

The objectives reported above have been developed and explored in three different thematic workshops, which took place during the 2023-2024 mandate and whose results are reported in Annexes 1, 2, and 3 of this report.

As the thematic workshops that took place from October 2023 to June 2024 developed the objectives not in the order in which they are listed above (1 to 4) but according to the interests expressed by the Delegations taking charge of their organization, in the following paragraphs, reference will be made to the chronological order in which the various workshops followed one another.



## 2. OUTPUTS OF THE OBJECTIVES OF THE 2023-2024 MANDATE

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### 2.1 Outputs related to Objective 3

A theme of absolute relevance – underlined by objectives 3 – concerns the so-called “demographic winter” that affects many Alpine areas.

Alongside the depopulation of the Alpine areas, there is, in parallel, the abandonment of cultivated lands and a reduction in the main economic circuits, triggering a negative feedback process that tends to feed itself. The phenomenon is present in almost all the countries that are part of the Alpine Convention (Camenisch and Debarbieux, 2011; Alpine Convention, 2015; Butte, 2022), although it should be emphasized that there are some territorial examples where this phenomenon is only marginal (for example Trentino - Alto Adige for Italy: Besana, Miorelli, Zatelli, 2003; Varotto, 2024).

To address the phenomenon of depopulation in the Alpine areas and identify the right actions, it is important:

- to evaluate the generational turnover in agriculture/forestry ensured by the local/national population in the Alpine regions and the main causal drivers;
- the potential agriculture and forestry employment opportunities for other communities (national or foreign);
- the dynamics of land abandonment and the administrative/collective processes necessary for their recovery for productive purposes.

This theme was the focus of the first thematic workshop organized by the Austrian and Swiss Delegations in October 2023 on "**Depopulation and abandonment of Alpine areas: role and opportunities offered by the agri-food and forestry economy**" (Annex 1).

During the workshop, some elements of knowledge emerged that helped to better understand the phenomenon. The first point concerns demographic and economic developments, which in the Alpine Convention countries are not homogeneous and vary from region to region. However, some trends are emerging as follows:

- The Eastern and Southern parts of the Alps show a greater decline in population than the Central Alps.
- Altitude above sea-level does not explain differences in socio-economic development, though the effect as a barrier becomes more evident in combination with accessibility to services of general interest.
- There is a gradient of increasing attractiveness from rural areas to cities, which only good quality of life and efficient services can effectively counteract.
- The respective national affiliation and the different strategies for tourism, regional development, and agriculture have an important impact on socio-economic changes and development at local level.
- A loose connection exists between the development of agricultural and forestry holdings and the overall demographic trends. However, tourism, agriculture and forestry can positively influence each other. For this reason, the organization of

economic systems in a district form (networks among farms/companies) can represent an additional opportunity for the local development.

The good practices presented highlight the need for a very complex and interconnected framework of actions and policy interventions to support the economy and demography of the Alpine areas.

The role played by regional political actors is very important, not only for the development policies defined at the local level but also for their ability to influence the offer of policies by higher political levels. Territorial development policies must ensure the presence of fundamental infrastructures for mobility, web connections, and the offer of essential health and education services, to keep peripheral urban and rural settlements alive. In the long term the application over time of specific indicators on demography and employment can help local authorities to identify regions subject to depopulation and, therefore, in need of targeted interventions. Attention to the legislation regulating land ownership can also be helpful, because in some territorial contexts (such as Austria) some laws can represent important obstacles for the formation of land ownership of those (national or foreign citizens) who are interested in moving to the Alpine area to carry out agricultural or forestry production activities.

## **2.2 Outputs related to Objectives 2 and 4**

Another critical issue to ensure that agricultural and forestry activities can remain sustainable in the long term from an economic, organizational, and ecological point of view is represented by the activation of processes of circular economy (Objective 2), at the same time promoting the introduction of new technological innovations (so called “smart technologies”) offered by applied research in the field of Information and Communication Technology (ICT) (Objective 4). This topic is also considered of the utmost importance by the European Commission, which has warmly promoted it within the framework of the Green Deal (Reg. UE 2021/1119) to achieve climate neutrality by 2050. So, this process must also involve agricultural and forestry companies operating in Alpine territories to make their activities more sustainable and rewarding, even though their small economic size may constitute a barrier not easily overcome.

The circular economy and the applications of “smart technologies” are two distinct themes that respond to different needs, even if both contribute to achieving environmental and climate objectives. With the circular economy, we try to extend the life cycle of some goods, reusing the by-products that become, in effect, an output of the production cycle and an input for other processes. In this way, we can prolong the value chain, reducing the problems of disposal of by-products, allowing an increase of the value of the overall production. In the food and wood industries, there are many examples of reuse of what was considered by-products until a few years ago.

Smart technologies can provide complex sets of data that, when processed on an ICT level, allow for the improvement and more efficient implementation of choices made at a corporate or over-corporate level (at a local or regional level).

This complex theme was the focus of the second thematic workshop organized by the Italian Delegation in March 2024 on “**Circular economy and smart technologies for Mountain agriculture and forestry: an overview of the current trend in the Alpine countries**” (Annex 2).

The purpose of the workshop was to understand to what extent and with which strategies it is possible to increase the implementation of virtuous economic choices and smart technologies to reduce the impact and increase production of agricultural and forestry activities in Alpine environments.

The outputs of the workshop allowed to better focus on:

- which supply chains connected to agricultural and forestry production are most suitable for achieving the ecological transition;
- which intelligent technologies in small and medium-sized agricultural and forestry activities may allow innovation while respecting tradition;
- the identification (also through the analysis of projects and farm cases) of the most suitable forms to facilitate the adoption of smart techniques/technologies in Alpine areas.

During the workshop, the different presentations contributed to a better understanding of what can be implemented as circular economy in Alpine environments and which technological innovations can be within the reach of individual mountain farms or be available to political decision-makers or local administrators called upon to manage complex situations in mountain territories (such as the correct management of diseased forests or forests affected by insect attacks, or the correct management of forests whose ownership is very fragmented). Some examples have been also presented concerning the forestry and apple sectors, using clean and scalable technologies such as hydrodynamic cavitation.

As regards smart technologies applied to crops, the following advantages have emerged from their application:

- Reduction in chemical inputs use and environmental impact: the presence of sensors and complex data processing systems allows to adapt the operating speed of the machines to the canopy cover, and to dose the chemical inputs in the quantities actually necessary;
- Reduction in human labour needs: the automation of several work phases reduces the need of human labour in the field, making agricultural work less tiring (and more attractive);
- More wellbeing and safety for farmers (e.g. lower exposition to chemicals);
- Costs reduction and better profit: lower use of chemical inputs and hours of human labour reduces production costs, although it should be underlined that the implementation of these technologies requires investments in machines and IT systems for data processing, as well as specific skills to be transmitted to farmers.
- Attractiveness for young people of the new techniques/technologies.

The real challenge for the application of these smart technologies in Alpine territories is, therefore, to find suitable ways of transferring them within small mountain agricultural and

forestry ownerships through the establishment of consortiums that can provide services of this kind and transfer proper skills directly to the smaller companies.

As for new technologies based on the massive collection and processing of territorial data, these generally come from larger areas than individual farms through the use of drones or satellites. Therefore, the numerous applications presented show a more useful application at larger-than-farm/forest scale for political decision-makers, administrators, or consortia operating at a local or regional level.

Interesting applications were presented for the management of forests affected by extensive attacks by insects or other diseases, the verification of stress conditions of forests affected by phenomena linked to climate change (drought, fires, etc.), and the possibility of organizing mixed interventions (public-private) for the management of forests characterized by high fragmentation of properties.

The workshop presented also interesting experiences of cooperation in agriculture and, particularly forestry. For the latter, the collaborative approach proved successful to leverage sustainable forest management of fragmented forest properties (example in the Carnia region of Friuli Venezia Giulia in Italy).

### **2.3 Outputs related to Objective 1**

The third theme developed during the mandate, corresponding to objective 1, concerned multifunctionality, a concept that refers to the different functions (economic, social, environmental) that agriculture and forestry perform in Alpine territories. It should be emphasized that these territories are characterized by a high fragility, which is linked to numerous interrelated factors:

- the demographic crisis and the depopulation of mountain areas, which, as we have already seen, has made generational turnover in agricultural and forestry activities difficult for many years now;
- the economy in Alpine areas that develops through different activities (agriculture and related supply chains, forestry and wood industry, hospitality and tourism, handicraft activities), involving, on average, small-sized companies, often family-run, therefore more exposed to the negative effects of inflation, possible recessions in the general economic contest and unfavourable financial trends (increase in interest rates);
- moreover, due to its features, the mountain economy is conditioned by factors exogenous to the mountain, such as climate trends (e.g. snowfall that affects winter sports) and climate changes that expose the territories to extreme situations (drought or, on the contrary, violent and not easily controllable floods, landslides, fires, etc.) and to uncontrollable physical phenomena, such as the increase in temperatures, responsible for the melting of glaciers and the decrease in water reserves that forcefully hit the territories that inevitably interfere with the productive activities and the local communities;

Despite these weaknesses, the multifunctionality of mountain agriculture and forestry gives them an additional strength that is absent in other territorial contexts. In fact, the role played by agriculture and forestry in the Alpine context is not only that of production in the strict sense. Thanks to less intensive production models that are sensible to land

maintenance, mountain agricultural and forestry companies can produce excellent quality milk, meat, cheese, wood, and derived products. At the same time, they offer ecosystem services of general interest to protect the rich biodiversity of Alpine environments and mitigate the significant impacts determined by climate change much more effectively than more intensive production models can do. Appropriately re-planned, traditional production protocols can be recovered and valorised by strengthening the link that typical products have with these territories and with local traditions.

Multifunctionality is not a new topic in Europe: it was discussed and recognized as linked to agriculture and forestry by the Common Agricultural Policy since the beginning of the new millennium with Agenda 2000. The current 2023-2027 Common Agricultural Policy and programming has also strongly highlighted the need to production models in agriculture and forestry that are going towards multifunctionality. The ten key objectives to reach up to 2027 underline again the different economic, social, and environmental roles played by agriculture and forestry, and all together, they indicate the different dimensions included in multifunctionality. So, multifunctionality is still a topic of maximum importance for policymakers and citizens today, after the COVID-19 pandemic, because everybody has become more aware of the importance of living in a healthy, less polluted environment, more respectful of the needs of plants and animals living there.

This objective was then explored in depth through a third thematic workshop, organized in June 2024 by the Slovenian and German Delegations, entitled: **“Peatlands and carbon farming, pastoralism, forestry and multifunctional activities in the Mountains for the Sustainability of the Alpine Environment.”**

The workshop sought to explore very current themes, including:

- the promotion of sustainable agricultural and forestry practices in the Alpine regions, such as the restoration of peatlands, widely present in the Alpine region, which, on the one hand, can contribute to mitigate the impacts of climate change thanks to their very large carbon stocks removed along time from the atmosphere, but at the same time allow farmers to benefit from these initiatives;
- the valorisation of local resources such as mountain grass and hay that give a particular quality to the milk and meat of animals (cattle, sheep, goats, poultry) raised with these feeds, allowing the activation of value chains for the preservation of the traditional and cultural heritage deeply rooted in mountain agricultural production throughout the Alpine region;
- the ecological value of mountain forests and the role of forestry in their eco-sustainable management, with practices that support the health, longevity, and biodiversity of forests while maximizing economic and ecological benefits, also for future generations.

Numerous studies have highlighted that peatlands act as stocks and sinks for CO<sub>2</sub> and are therefore able to effectively counteract the increases of this greenhouse gas in the environment (Bridgham Scott D. et al., 2008; Worrall F. et al, 2010; Robroek JM et al, 2017). Furthermore, they can maintain a rich plant and animal biodiversity in humid areas (Gopal B., 2009; Wiegand G et al, 2017). The re-wetting of some areas also allows the safeguarding of the landscape and promotes a correct water balance at a local level.

Peatland restoration is, therefore, a key element for sustainable agriculture and climate change mitigation. For this reason, it is important to have a good overview of the type of soils in Alpine peatlands and the type and extent of land use. Furthermore, farmers are the key to their maintenance and restoration, so involving and convincing them, and supporting them financially and with appropriate advice is important. Paludoculture is a good example of a new value chain of interest for Alpine farmers.

Support for supply chains connected to Alpine livestock farming is another key point that emerged during the workshop. A rich literature has long emphasized that the use of fresh grass and hay obtained from mountain pastures, together with the use of native breeds suited to live in mountain contexts, give better organoleptic characteristics to the milk, meat and eggs products compared to those of the corresponding products from intensive and conventional lowland agriculture (Bele, Osterlie and Norderhaug, 2010; Cozzi, Franceschin and Segato, 2014; Covaci and Covaci, 2023). Furthermore, traditional technologies connected to the local processing of milk and meat allow for producing a rich basket of Protected Designation of Origin (PDO) and Protected Geographical Indications (PGI) products that characterize the different Alpine areas and clearly underline the strong link between cheeses and cured meats and their territories of origin. Tourist flows increasingly appreciate and request this type of product in tourist resorts and urban centres closest to the Alpine territories of origin. Safeguarding the supply chains linked to typical local products is therefore fundamental because it constitutes an indispensable income opportunity for mountain farmers, while at the same time preserving the heritage of local traditions and culture.

Concerning ecosystem services provided by Alpine forests, the presented reports highlight the difficulty of defining their nature and typology in different local contexts and the "value" associated with them. Consequently, it is difficult to create innovative markets for these services that can express a direct payment, even though there is a set of public and private entities interested in expressing a demand for these services. Another difficulty is represented by the identification of business models of forest management tailored to the different local contexts existing along the Alpine arc. The presentation of an Alpine Space project (Forest Eco-Value) highlighted the need to adopt diversified strategies for managing Alpine forests. Adopting an integrated approach that considers, on the one hand, the complexity of natural systems, on the other, the set of local socio-economic dynamics and the needs of the stakeholders involved can help to define solutions, operational tools, practices, and targeted lines of action.

### 3. CONCLUSIONS AND RECOMMENDATIONS

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The Alpine Area is made of fragile and complex territories, with more or less evident differences in the various countries and areas that are part of it. The social, economic, naturalistic, and climatic components intertwine, overlap, and influence each other, producing a mosaic of situations that cannot be traced back to a single development model.

Fragility is undoubtedly one of the aspects that mainly unify all the areas along the Alpine arc. The causes are multiple, identifiable above all in:

- climate change;
- mountain economy, based on highly interrelated production sectors, on small and medium-sized businesses, and strongly influenced in its results by climate change and the general economic context;
- the progressive depopulation of many mountain territories, often penalized in terms of economic opportunities, income and use of essential services (health, education, transport, internet).

The increasingly evident exposure of mountain territories to climate change, and the difficulties in intervening with practical solutions to rapidly mitigate its effects probably represent, today, the first cause of fragility, which can generate adverse impact on the presence of communities in the various areas, on the economic development, on biodiversity, water availability and the maintenance of traditional Alpine landscapes. The mandate's objectives were chosen precisely to highlight the significant critical factors for the Alpine areas, but at the same time, to identify the potential offered by mountain agriculture and forestry, by new smart technologies, and the possibilities offered by the circular economy to counter these critical issues.

Agricultural and forestry activities, being in direct contact with the ecosystems hosting them and being managed/manageable with low-intensity production models, represent an important lever for action to mitigate (and hopefully in the future counteract) the effects of climate change, the reduction of biodiversity and to improve landscape maintenance. The multifunctionality of these production activities - in themselves also fragile because they are based on the activity of small family businesses with a generational turnover that is not always easy - is a factor that makes them potentially more effective than other production sectors in counteracting and mitigating locally the negative effects mentioned above. The strength of agricultural and forestry multifunctionality is expressed - as much empirical and research evidence now shows - in the limitation (in the case of sustainable livestock and crops farming) or even the mitigation (for example, in the case of peatlands and sustainable management of forests) of the emissions of greenhouse gases; in the protection of biodiversity; in the landscape care and maintenance; in the safeguarding of the cultural heritage and traditions with which local communities identify. These are key factors for making these territories attractive for young people, local populations, and seasonal tourist flows.

One of the reasons why young generations tend to move away from mountain communities is linked to the working conditions in the agricultural and forestry sectors, which are undoubtedly more challenging and demanding than those in the plains. Introducing new smart technologies ("Smart Farming", Agriculture 4.0, Smart Forestry) in the mountain agricultural and forestry sector represents a way to respond to the needs and skills of new generations who live in the mountains and seek operating conditions comparable to those of other productive and different sectors and decision-making processes more supported by data collection. Their introduction within small mountain realities, while making working conditions less onerous, inevitably requires adaptations due to the technical skills required and the potentially high costs. The importance of new technologies based on the collection and interpretation of satellite data or data provided by drones is also expressed in supporting decision-making processes by institutions and administrators at local, regional, or possibly transnational levels, supporting decisions through continuous information monitoring.

The circular economy is another emerging topic. When it can be implemented in mountain contexts, it allows the value of some supply chains to be extended – some examples have been presented concerning the forestry and apple sectors – offering, on the one hand, additional opportunities to farmers and forest owners in terms of the exploitation of by-products that would otherwise be disposed of, and on the other hand reducing the consumption of resources and thus making production processes more sustainable. For ecological transition, this production model should also be encouraged in Alpine areas because it reduces pollution and pressure on the environment, reduces global warming, and contributes to the protection of ecosystems.

Alpine agriculture and forestry, therefore, move with differentiated development models based on the peculiarities of the territories, their vocations, and the specific opportunities and problems present. Local agricultural and forestry products activate important downstream supply chains that further characterize the territories: cheeses, cured meats, bread, and other typical Alpine products have unrepeatably characteristic characteristics in other production contexts and are highly appreciated by the market. Similarly, tourism and the sectors connected to it (hospitality, wellness, catering) manifest themselves in different forms and intensities, depending on the type of offer that can be created in the different areas.

All this must be supported and defended with policies, lines of action, and practices tailored to the economic and social contexts that are present locally. The challenge for the coming years will be to be able to create lasting relationships of planning, complementarity, and cooperation between the different economic sectors (agriculture, crafts, wood industry, and tourism) and the various stakeholders involved (politicians, administrators, local representatives of farmers and forest owners, small and medium-sized local businesses, cooperatives, research institutes, etc.) so that together they can work "as a system" to offer farmers and foresters integrated development proposals, alternatives to forms of economies and tourism that are more strictly seasonal and have a greater impact on the environment.



## Recommendations:

1. Living conditions in Alpine areas must ensure job opportunities, sufficient income, and accessibility to good quality services, transport, culture, and education.
2. Farmers and foresters in the Alps are responsible for land management and landscape maintenance. They provide other important ecosystem and socio-cultural services, such as continuing traditional practices and transmitting ancient knowledge to new generations, so policymakers must preserve their work. Farmers and foresters operating in the mountains must be supported with adequate policies, funding, and research, regardless of the size of the farms or forests, which are often small and fragmented.
3. Support for associations and cooperation, especially in the dairy and wine processing phases and for the marketing activities of other products connected to local value chains, is important because it strengthens the bargaining power of individual producers.
4. The organization of economic systems in a district form (networks among companies working in different sectors – e.g. from primary production to transformation) can represent an additional opportunity for the local development in the Alps. From this perspective, tourism represents a key economic activity because it can support a wide range of related activities: open air sports and activities, hospitality, catering, cultural events, and well-being.
5. The application of new ICT and smart agriculture/forestry technologies allows for the improvement of management choice processes that concern the wide Alpine territories, even at a cross-border level, and must, therefore, be introduced and supported to help political decision-makers and local and regional administrators.
6. It would be desirable to establish consortia or companies that allow for the accessibility of automation and rationalization services in the use of chemical inputs in crops grown in Alpine environments.
7. The mountain economy must be supported in all its components (agriculture, forestry, wood industry, hospitality, wellness and catering sector, artisan companies), ensuring that public resources reach mainly small and medium-sized local businesses and support projects aimed at de-seasonalise mountain dwelling and tourism.
8. Alpine supply chains maintaining close ties with the territory, local communities, and traditions must be supported on a technical, financial, and marketing level because they provide additional income opportunities for farmers and contribute to keep alive the heritage of knowledge underlying Protected Designations of Origin (PDO), Protected Geographical Indications (PGI), and traditional specialty guaranteed products.
9. Although the production cycle in mountain areas is traditionally less impactful (the often limited resources are sustainably used and re-used when possible), the circular economy approach is of high relevance also for the Alpine economy. In this respect, circular economy can provide additional income. The transformation of waste into resources can also be innovative and attractive for young generation
10. Cooperation among public and private owners is particularly important in the forest sector. The cooperation with new collaborative approaches, supported by innovative tools and platforms can make forest management in the fragmented Alpine territory more sustainable and profitable, allowing for shared economy and reducing abandonment trends.

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**ANNEX 1 Report of 1<sup>st</sup> Workshop – Depopulation and Abandonment of Alpine Areas: Role and Opportunities offered by the Agri-Food and Forestry Economy**

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# **DEPOPULATION AND ABANDONMENT OF ALPINE AREAS: ROLE AND OPPORTUNITIES OFFERED BY THE AGRI-FOOD AND FORESTRY ECONOMY**

*Report of the first thematic Workshop of the  
Working Group Mountain Agriculture and  
Mountain Forestry of the Alpine Convention  
Online, 25.10.2023*

**Organized by the members of the Austrian and Swiss Delegation of  
Mountain Agriculture and Mountain Forestry Working Group (MAMF)**

Daniel Baumgartner, Barbara Färber, Philipp Gmeiner,  
Ingrid Machold, Michael Prskawetz, Elisabeth Schwaiger

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# 1. SUMMARY OF HIGHLIGHTS

The aim of the first thematic workshop of the Working Group Mountain Agriculture and Mountain Forestry (MAMF) during its mandate 2023-2024 was to get an overview of trends in land abandonment and population development in the Alpine countries. Policy approaches in Austria and Switzerland were compared and good practice examples were presented:

The demographic and economic development in the countries of the Alpine Convention is not homogeneous and varies from region to region. Nevertheless, certain trends are emerging as following:

- The Eastern and Southern parts of the Alps show a greater decline in population than the Central Alps.
- Cities tend to show an increase of population, whereas in rural regions the population trends are very diverse.
- The respective national affiliation (e.g. strategies for tourism, regional development, and agriculture) has an important impact on socio-economic changes and development at local level.
- There is only a loose connection between the development of agricultural and forestry holdings and the overall demographic trends. However, tourism and agriculture can positively influence each other.

To shed light on the Austrian policy approach an Austrian researcher introduced a study on how to change the narrative in regions with population decline. Together with stakeholders from three pilot regions, examples for positive language images and narratives were developed in order to achieve a positive impact. A decisive factor is a change of the mindset of regional actors and the impetus to get into action. Hence, regions are able to contribute to openness, although many competencies are at a higher level. The study focus was not only on population growth, but also on quality of life.

In Switzerland, spatial development policy aims to maintain a decentralized settlement of the country. As in other countries, low population density lead to high costs for the provision of infrastructure in mountain and peripheral regions in Switzerland. Agricultural policy has the task to ensure that agriculture contributes to a decentralized settlement. Three instruments are applied accordingly: direct payments, structural improvement measures and sales promotion. The regional development project "Le grand Entremont" in the canton of Valais is a positive example that aims to strengthen regional value creation in agriculture and the associated value chains in coordinating the marketing of regional products. In addition, agritourism products and services were implemented to complement the tourism offers in the region.

The challenges of limited access to essential or useful services was addressed in the Apennines Mountains. The region Abruzzo has issued a regional law to revitalize the social and economic structure of small mountain municipalities. An index, comprising a set of six indicators on e.g. demography, employment, supports the local authorities to identify regions subject to depopulation. This statistical analysis could also be applied in territories with similar problems.

The research project "Newcomers in high mountain areas of the Austrian Alps" provided insights into the situation of newcomers to Alpine agriculture and the social and spatial dimension of lifestyle mobility. The results show that new entrants hope to achieve a „better „or „different" lifestyle through farming. They want to regain control over food production. Although new entrants cannot be considered "hobby farmers", this trend is largely neglected by rural communities and agricultural

policies. The mistrust of family farmers towards an extra-familial farm transfer and, especially in Austria, the strict land transfer laws are major obstacles for new entrants' land tenure.

Finally, the Institut Agricole Régional (IAR, Aosta/Italy) reported about their research experience to prevent mountain depopulation. IAR was involved in many national and European projects in the field of sustainable management of natural resources in particular in the context of the impacts of agricultural practices on the environment. The topics of the Institute are agri-food production and diversification of agricultural income, technical innovation, crop protection and development of local resources.



## 2. OVERVIEW

On October 25, 2023, an online-workshop on the topic of "Depopulation and abandonment of Alpine areas: role and opportunities offered by the agri-food and forestry economy" took place online. Members of the Austrian and Swiss delegation of the working group Mountain Agriculture and Mountain Forestry (MAMF) of the Alpine Convention organized the meeting. In total 39 people participated.

### Objectives of the thematic Workshop

The workshop contributes to objective three of the current MAMF mandate, which focuses on *understanding which physical (e.g. climate change), social (e.g. abandonment, loss of knowledge) or demographic (e.g. depopulation, ageing) risks threaten mountain agriculture and forestry and related actions to be implemented.*

The main goals were:

- To get an overview of current trends in land use (with a particular focus on "land abandonment"), population development (and consequently: de-population) and economic development in the Alpine countries.
- To compare policy approaches of agriculture and forestry in Austria and Switzerland to deal with demographic and economic trends against the background of the risk of land abandonment (and consequently: de-population).
- To present and discuss good examples of how to deal with these trends in the Alpine countries.

### 3. ABSTRACTS OF PRESENTATIONS

In the introductory speech, Simonetta Baisi and Paolo Angelini referred to the fifth Report of the State of the Alps that describes demographic changes in the Alpine area. The report showed that differences in demographic growth are related to accessibility, topography and altitude, socioeconomic factors, position and role of the Alpine region in each country. The main outcome includes a multidimensional poverty index to show the dynamics of the demography and the labor market.

Overall, the population in the central and northern Alps is growing, while decreasing in the eastern and some southern parts of the Alps. Due to immigration, the population growth remains positive. The continuous ageing of the population requires reconsideration of the local welfare systems. Overall, the economic development across the Alps is very heterogeneous.

#### **Demographic and economic development in the Alpine Convention area**

By Tobias Chilla, Institute of Geography, Friedrich-Alexander-University Erlangen

##### **Theme and good practice presented**

The Alpine area is characterized by sectoral complexity and very diverse growth patterns: The demographic and economic development at local level differs considerably, although some broader tendencies are recognizable. While population change is more pronounced in the Western Alps, the Eastern and Southern part shows a more distinct tendency of population decline. With regard to the development of the labor market, the employment trend indicates a north-south gradient.

##### **Possible drivers of the socio-economic development**

- Topography: altitude above sea-level does not explain socio-economic development, though the effect as a barrier becomes more obvious in combination with accessibility to services of general interest.
- National affiliation: national affiliations do explain the socio-economic changes to quite a large extent and are therefore a strong driver of socio-economic development at local level.
- Urban-rural differences: Metropolises and the larger cities are usually the centre of population increase, whereas the patterns in the rural areas are much more diverse.
- Mountain agriculture and forestry: The relation of farm development and general demographic development shows only a loose connection.

##### **Future prospects for the transfer and implementation of the good practice**

The socio- economic development is diverse and shows complex patterns. Policies and national affiliations (e.g. strategies for tourism, regional development, and agriculture) seem to matter most and we can see clear pan-European differences. It shows that policy based on place-based approaches matters most.

Tourism and agriculture show a rather clear connection. The stronger the tourism, the more stable the farming situation tends to be. This point favors the argument of diversification – combining tourism and agriculture is a promising strategy.

More information is available in annex 2.

## **Policy approaches in Austria**

by Katharina Drage, Rosinak & Partner ZT GmbH, Vienna

### **Theme and good practice presented**

In Austria many rural regions show population decline. This trend will continue in the future and represents a challenge for the regions and the funding institutions. The project "Strategies for regions with declining populations" launched by the Austrian Conference on Spatial Planning addressed this problem. The goals were to enhance knowledge of regions with population decline and to develop positive narratives. Three regions in Austria (Osttirol, Nockberge, Obersteiermark Ost) served as pilot regions for analyses and discussions.

### **Opportunities**

In the pilot regions examples for positive language images were developed. New narratives can overcome the often-existing lethargy and trigger a new dynamic in the regions. It is important that the regional actors themselves generate a new language to change their mindset (bottom up). Every region needs individual narratives based on its strength and skills. The project shows that regions should not only focus on growth but also on quality. Thus, the quality-oriented Austrian agriculture and its integration into regional value chains make an important contribution to mitigate the population decline.

### **Future prospects for the transfer and implementation of the good practice**

Particularly in regions with population decline, support is needed for regional development and intermunicipal cooperation. This requires:

- Appropriate staffing for regional and Leader management
- Training in organizational development, communication and media work

More information is available in annex 3.

## **Policy approaches in Switzerland**

By Daniel Baumgartner, Federal Office for Agriculture

### **Theme and good practice presented**

Agricultural policy framework aims to upkeep and strengthen a decentralized settlement in mountain and rural Switzerland. The case of a project for regional development in the canton of Valais was presented.

### **Opportunities and/or Weaknesses**

Opportunity: decentralized settlement is mentioned as a spatial development target in the Swiss constitution

Weakness: agricultural policy is assigned with the task for upkeeping a decentralized settlement mainly. Yet, a multi-sector approach might be needed.

### **Future prospects for the transfer and implementation of the good practice**

The example shows, that combining sectoral policy approaches (agricultural policy) with local bottom-up initiatives help to establish the economic basis in peripheral areas to sustain decentralized settlement also in remote areas.

More information is available in annex 4.

## **Depopulation in the Abruzzo municipalities**

By Domenico di Spalatro, Assunta Lisa Carulli, Alessandro Valentini

### **Theme and good practice presented**

Population decline is particularly relevant in the South of Italy and in the various settlements of the Apennines mountains, including municipalities of Abruzzo. The region Abruzzo has issued a regional law with the aim to revitalize the social and economic structure of small mountain municipalities subjected to depopulation and at the same time to promote its recovery and economic development. For the purpose of this law, "small mountain municipalities" have been classified to identify new socio-demographic and economic dimensions of depopulation in Abruzzo and to develop them through appropriate statistical analysis in order to support the local policy strategies aimed at contrasting this phenomenon.

### **Opportunities**

The components of depopulation appropriately identified and summarized through the use of an index make it easy to identify both the territories subjected to depopulation and the potential ones at the light of a multivariate set of components such as social, economic, and environmental aspects.

## **Future prospects for the transfer and implementation of the good practice**

The results are part of an information system whose scope is to support local policies aimed at contrasting demographic decline. This statistical analysis could also be transferred to other regions with similar problems concerning depopulation.

More information is available in annex 5.

## **Lifestyle Farmers: Who, Why and What Impact? Exploring New Entrants to Mountain Agriculture in Western Austria**

By Bernhard Grüner, Institute of Geography, University of Innsbruck

### **Theme and good practice presented**

Increasing affluence promotes rural lifestyles and mobilities that are not economically induced. Primarily urbanites seek a "better quality of life" by moving to the countryside. This study provides insights into the situation of newcomers to Alpine agriculture in Montafon and East Tyrol (both Austria) as well as in Vinschgau (South Tyrol, Italy), focussing on both the social and spatial dimensions of lifestyle mobility.

### **Opportunities and/or Weaknesses**

The newcomers surveyed have a relatively high level of education. They are in search of a "better" or at least "different" lifestyle, which they hope to achieve through farming. Specifically, the new entrants hope to regain control over food production and consumption through self-sufficiency. The new entrants' agriculture shows tendencies towards (retro) innovation. On the one hand, the new entrants studied are reintroducing earlier species and practices that were once typical for the region but have been displaced by the mechanisation of agriculture. On the other hand, they are experimenting with new techniques and species based on organic farming and beyond.

## **Future prospects for the transfer and implementation of the good practice**

Although there are also innovative long-established family farms in the case study regions, generations of entrenched farming practices and attitudes can prevent family farmers from immediately changing existing farm management. Furthermore, while family farms are usually residential and production sites, new entrants tend to open up their farms and practices to wider society.

More information is available in annex 6.

# **Training and research to prevent mountain depopulation: the Institut Agricole Régional experience**

By Michele Sigaud, Institut Agricole Régional; Aosta

## **Theme and good practice presented**

Institut Agricole Régional (Aosta) is a foundation that carries out technical and vocational education, training in agriculture, but also research and experimentation in mountain farming, paying particular attention to sustainability and environmental protection.

## **Opportunities**

Training for operators in mountain territory can be a way to improve the economic and environmental sustainability, to develop a multifunctionality of the activities carried out, that gives the possibility to remain to garrison a territory. Therefore, agriculture could become a focal point to attract tourist flows essential to ensure the permanence of populations in the mountains.

## **Future prospects for the transfer and implementation of the good practice**

The role of rural activities is of high importance for the production, care, and use of the landscape, the maintenance of traditional social structures, and as a multifunctional basis for other economic sectors. Over the years, the researchers and technicians at IAR have gained a lot of experience in the field of sustainable management of natural resources in particular in the context of the impacts of agricultural practices on the environment, which they share with other project partners in several European-wide projects.

More information is available in annex 7.

## 4. DISCUSSION AND CONCLUSIONS

The discussion started with different aspects of abandonment. As a first sign the aging of population was perceived, which leads to considerable damages at various levels. The loss of crops has been addressed as well as a loss of traditional farming and the connected value changes. Abandonment can also mean a loss of biodiversity and landscape diversity, which is an essential requirement for a territory to remain attractive for residents and their quality of life. Good living conditions in Alpine areas must guarantee job opportunities, sufficient income, and accessibility to good quality services, transport, culture and education. However, the attraction of a region is also linked to its history, gastronomy and traditional products. These are primary drivers to attract tourists, who can revitalize local economies and lifestyle. Active, young people are essential to respond to a new tourist demand, which is made up by different components e.g. wellness, sports and culture. Farmers are responsible for territory managements, provide other ecosystem services e.g. maintenance of landscape, continuation of traditional practices, and bring ancient knowledge to a new generation. Proper policies and research, as well as funding are important to support these farmers to operate in the mountains.

The population change in recent years in the Alpine region is complex and has no simple explanation. In summary, the socio-economic development is diverse and shows complex patterns. The dynamic in agriculture development is characterised by a general strong loss of farms between 1990 and 2010, tourism and agriculture show a rather clear connection. Interestingly, a high number of beds per inhabitant correlates to a stable number of farms. The stronger the tourism, the more stable the farming situation.

Also, training of farmers to operate in mountain regions is an important way to improve the economic and environmental sustainability and productivity. Mountain products are characterized by typicality and quality, thus rural and regional development activities are of high importance for production, care and use of landscape.

Climate change is occurring at a faster pace in the Alps than elsewhere: The Alps see a faster pace and higher impacts of climate change than other European regions. The rise of the average temperature in the Alpine area is nearly twice as much as in the surrounding areas and consequences of climate change, such as more frequent extreme weather events and natural hazards, affect society and economy in the Alps in an over-proportional way<sup>1</sup>. Climate change particularly affects agriculture and forestry.

Considering this regional development will need to adapt in a flexible way. On the other hand, climate change could push migration of people from urban to Alpine municipalities. Currently this movement is not well documented, but there should be transnational efforts to explore how climate change will affect the socio-economic changes and manage this potential movement of people<sup>2</sup>.

In addition, the recent trend of digitalization during the COVID-19 pandemic has changed negative trends in some municipalities to a positive migration. However, it is not certain whether this trend will continue. There is a lack of statistics of people, who are “multilocals”. Data collection is currently only covering permanent relocation, but the overall development in temporary relocation and mobility is much higher. More data from a social scientist perspective should be provided. Quality of life is an important indicator on how successful policy implementations in mountain regions are.

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<sup>1</sup> <https://www.alpconv.org/en/home/news-publications/publications-multimedia/detail/climate-action-plan-20/>

<sup>2</sup> <https://www.miclimi.it/>

New entrants to mountain agriculture hold potential for generational and sustainable change. They usually did not grow up in agriculture, but they decided to take over a farm often seeking to improve quality of life. Most of them have a relatively high level of education and are usually either locals or regionals. Their goal is often to be self-sufficient, but they also employ methods like direct and online marketing. They have a tendency towards “retro-innovation”, meaning they often use traditional methods or species, but are also open to explore new and innovative techniques. In absolute numbers, however, new entrants seems to remain only a niche phenomenon.

Despite the different developments in the Alpine countries, joint initiatives and learning from each other is vital. The change of narratives to a more positive outcome (as shown in Austrian example) can be important for regional development. However, post-growth scenarios are necessary to prepare, as in some parts demographic growth is not realistic. Policies need bottom-up approaches and involvement at municipal levels to be successful. Without innovation and a long-term vision, it is hard to make a difference.



## 5. ANNEXES

### Annex 1 Agenda

Agenda item	Timing
Login on Zoom platform* and work opening	09:00-09:15
Welcome and introduction into the event Simonetta Mazzarino, University of Turin, and Chair of the MAMF Working Group Giorgio Matteucci, National Research Council of Italy (CNR), and Chair of the MAMF Working Group Paolo Angelini, Italian Ministry of Environment and Energy Security	09:15-09:35
Demographic and economic development in the Alpine Convention area Tobias Chilla, Institute of Geography, Friedrich-Alexander-University Erlangen	9:35-10:00
Policy approaches in Austria Katharina Drage, Rosinak & Partner ZT GmbH	10:00-10:25
Policy approaches in Switzerland Daniel Baumgartner, Federal Office for Agriculture	10:25-10:50
<b>COFFEE BREAK</b>	<b>10:50-11:00</b>
"Spotlights" – best practice from the MAMF Countries	11:00-11:30
Depopulation in the Abruzzo municipalities Domenico di Spalatro, Assunta Lisa Carulli, Alessandro Valentini  Lifestyle Farmers: Who, Why and What Impact? Exploring New Entrants to Mountain Agriculture in Western Austria Bernhard Grüner  Training and research to prevent mountain depopulation: the Institut Agricole Régional experience Michele Sigaud	
Final Discussion Ingrid Machold, Federal Institute of Agricultural Economics, Rural and Mountain Research	11:30-11:50
Closing of the workshop Simonetta Mazzarino and Giorgio Matteucci, Chairs of the MAMF Working Group	11:50-12:00

## **Annex 2 Demographic and economic development in the Alpine Convention area**

By Tobias Chilla, Institute of Geography, Friedrich-Alexander-University Erlangen

### **Background**

The Alpine area is a dynamic territory characterized by sectoral complexity and diverse development patterns. The population change patterns in the Alpine area are as diverse as those on the pan-European level. However, the overall population change of the Alpine perimeter is clearly stronger than the European one.

Within the Alpine perimeter, the demographic and economic development at local level differs. While population change is more pronounced in the Western Alps, with many municipalities showing an increase of population, particularly in France, Switzerland and Germany, the Eastern and Southern part shows a more distinct tendency of population decline in many municipalities. With regard to the development of the labor market, the employment trend indicates a north-south gradient, with a negative development of the numbers of employees between 2012-2018 in many southern Alpine municipalities and towns in France, Italy and Slovenia (Chilla et al., 2022).

These socio-economic developments cannot be reduced to single drivers or indicators such as outmigration, ageing or decline in agriculture, even if changes in employment and population decline often go hand in hand. The following section looks into drivers of socio-economic changes in the Alpine area including its mountainous characteristics.

### **Drivers of socio-economic development**

#### Topography: not height as such but accessibility

Though topography is often discussed as a barrier, there is no easy correlation between altitude and socio-economic development (e.g. with regard to the indicators of population change and GDP trends) (Chilla et al., 2022, p. 18). However, in combination with accessibility, the patterns become much clearer.

Accessibility to different services of general interest, as doctors, primary schools and train stations, is higher for the more urbanized and pre-Alpine areas than for inner-Alpine areas. This is linked a) to lower population density in mountainous areas that come along with a lower density of medical services and b) to the difficulties to ensure a good technical accessibility in mountainous areas, due to expensive and complex infrastructure issues (tunnels, natural risks, etc.).

#### National affiliation is a strong factor

National affiliations can explain socio-economic changes in the Alpine perimeter to quite a large extent as there are considerable differences in demographic development between the Alpine states. For example, municipalities in Switzerland show an overall population growth, while many Slovenian and Italian municipalities are characterized by a stagnation in population development. Thus, national and regional policies (strategies for tourism, regional development and agriculture) are supposed to have an important impact when it comes to the socio-economic development of the Alpine regions.

### No strong explanation by urban-rural differences

Metropolises and the larger cities are almost always characterised by population increase, whereas the patterns in the rural areas are much more diverse. However, socio-economic differences between the Alpine countries are much more pronounced than urban-rural differences.

### **Mountain agriculture and forestry**

From 1990 to 2010, there has been a strong loss of numbers of farms (Streifeneder et al. 2022). Between 2000 and 2010, 22% of the farms in the Alpine region were abandoned, with even more pronounced losses in the years before (Streifeneder 2016). Particularly the numbers of small farms with less than five hectares declined considerably, especially in the southern Alpine range. However, the decline of farms does not necessarily go hand in hand with demographic decline. Mountain agriculture and demographic development are only loosely interconnected. As the Austrian case shows, a negative population development does not coincide with a particular negative farm development.

On the other hand, tourism and agriculture show a rather clear connection. A high number of beds per inhabitant correlates to a stable number of farms. The stronger the tourism, the more stable the farming situation tends to be. This point favours the argument of diversification. However, it is not possible to identify the exact reasons for this link (e.g. farmers work in tourism part-time, role of agro-tourism etc.).

### **Summary**

In summary, the socio-economic development is diverse and shows complex patterns. Policies and national affiliations seem to matter most when it comes to drivers of change. The dynamics in (mountain) agriculture are only loosely connected to the overall socio-economic trend, but depend much more on tourism activities and diversification strategies of national states. All in all, drivers of demographic and economic development relate strongly to policies. Thus, policy matters, even more when based on place-based approaches.

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## **Annex 3 Policy approaches in Austria**

by Katharina Drage, Rosinak & Partner ZT GmbH, Vienna

### **Background**

Developments such as demographic change and population decline pose questions and challenges for many regions. Many regions and municipalities in rural areas in Austria are affected by population decline. The forecast of the Austrian Conference on Spatial Planning (ÖROK) for 2030 suggests that this trend will continue in the medium to long term. All political districts with the exception of the provincial capitals and the statutory cities have sub-regions or individual municipalities with declining populations. This development perspective poses strategic questions both for the regions concerned and the funding institutions on national level: How can this phenomenon be described? What explanations are there, what can be done about it, what cannot be influenced and requires adaptation measures? These questions guided the project "Strategies for regions with declining populations" launched and managed by the Austrian Conference on Spatial Planning.

### **What were the goals of the project?**

Besides the enhancement of knowledge about regions with population decline a main goal was to develop positive narratives and an empowering language in contrast to the negative and depressing image such regions are often confronted with (for example "dying" regions or "shrinking" regions). The key findings of the expert team were summarized in twelve "headlines", and recommendations were also drawn up. The project contributes to spatial research and carries out recommendations for actions by the member organizations. Numerous partners participated in the project, like the federal chancellery, the ministry for rural development and the land Tyrol as lead partners. Three regions in Austria (Osttirol, Nockberge, Obersteiermark Ost) served as pilot regions for analyses and discussions.

Why do we need new narratives and frameworks for regions with declining population?

A decisive factor is that the development of new language images is not imposed from outside but generated by the regional actors themselves to change their mindset and to get into action.

This approach refers to concepts of behavioral economics, which are strongly connected with theories of framing. Every region needs individual narratives, built up on the strengths, the skills and the resources, which are available in the region. The turn in the mindset should be implemented bottom up but can also be triggered by top-down interventions of for example funding institutions. This requires a change of the mindset on regions with declining population in these institutions as well.

Together with the pilot regions examples for positive language images and narratives were developed:

- » Let's roll up our sleeves!
- » We can change successfully!
- » Coming and going is quite normal!
- » There is still room for development!
- » Innovation is possible in small communities as well!

Each of these empowering slogans was feeded by a story explaining the positive narrative and the strength of the region.

## **Summary**

The project's intention was to incorporate facts as well as emotions and frames into the project. This approach is intended to open up new perspectives. For example, immigration can also happen in regions with a declining population. Regions are not dying, but the population is getting older. Focus not only on growth, but also on quality. At the same time, it is clear that regions only have a certain amount of leeway. Many competencies lie with higher levels. However, regions can make a particular contribution to openness and a welcoming culture.

Project information: Österreichische Raumordnungskonferenz - Strategien für Regionen mit Bevölkerungsrückgang ([oerok.gv.at](http://oerok.gv.at))

## Annex 4 Policy approaches in Switzerland

By Daniel Baumgartner, Federal Office for Agriculture

### Background

Switzerland has experienced dynamic population growth in recent decades. From 7.6 million inhabitants in 2000, the population has risen to 8.6 million inhabitants in 2020 within just two decades. However, not all areas of Switzerland have grown equally dynamically. While the centers and agglomerations on the Central Plateau have grown strongly in the same period, many areas in rural and mountainous regions have even seen negative population development as shown in Figure 1 [1].

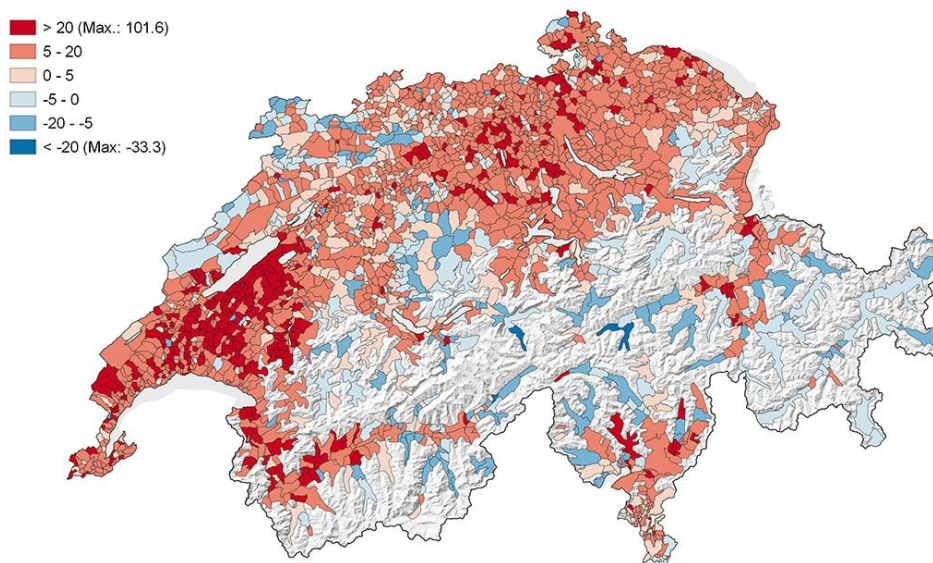


Figure 1:  
*Population dynamics [%] in Switzerland, per municipality, 2000-2020, Source: Federal Office for Spatial Development*

Such a spatially uneven population dynamic poses a challenge for Swiss spatial development. Swiss spatial development policy aims – among other targets – to maintain a decentralized settlement of the country. Such a settlement pattern is particularly at risk in mountainous regions: the low population density, exposure to natural hazards (avalanches, rock fall, etc.) and the economy's strong dependence on specific sectors such as agriculture, forestry and tourism lead to high costs for the provision of physical and social infrastructure (transport infrastructure, internet, school and health services, etc.). The Swiss Confederation is therefore challenged to implement the concept of decentralized settlement in a sustainable manner.

### Agricultural policy as a tool for fostering decentralized settlement

The decentralised settlement of the country can only succeed if Switzerland's rural and mountain areas remain attractive places to live and work. A highly attractive location and quality of life in turn require a multi-sectoral approach on the part of the state. Nevertheless, agricultural policy has a key role to play in Switzerland. According to the constitutional mandate (Art. 104 para. 1 let. c) [2], it has the task of ensuring that agriculture contributes to a decentralised settlement of the country.

Agricultural policy in Switzerland promotes a decentralised settlement mainly with three instruments [3,4]:

1. Direct payments: with around CHF 2.8 billion (1CHF=1EUR, as at Oct. 2023), the Swiss Confederation promotes the provision of public services such as the protection of biodiversity, the maintenance of the cultural landscape or the preservation of landscape quality (e.g. for tourism). Over two thirds of direct payments are made for services in hilly and mountainous areas. These also include payments that are tailored to the specific agronomic conditions and traditional management of summering areas.

2. Structural improvement measures: the Confederation provides around CHF 90 million (CHF 1 = EUR 1, as at Oct. 2023) in financial aid for infrastructure and construction projects in the agriculture and food sector. The financial aid is designed in such a way that it takes into account the specific conditions of mountain regions, i.e. it is higher the more peripheral or higher up the projects are realised. Structural improvement measures are financed as a joint task between the Confederation and the cantons. This means that the cantons also make financial contributions to the projects.

3. Sales promotion: with the protection of geographical indications of source and the labelling of regional products, the Confederation strengthens the added value of agricultural products of regional origin, especially from mountain and summering areas [5]. There is a demonstrably higher willingness to pay for these products compared to food produced elsewhere.

### **How does the toolbox apply in practice?**

The example of the "Le grand Entremont" regional development project (PRE) in the canton of Valais (VS) [6,7] shows that the instruments of Swiss agricultural policy make an effective contribution to decentralised settlement. The project aims to strengthen regional value creation in agriculture and the associated value chains. Specifically, this includes to:

- plan, co-ordinate and modernise milk and meat processing infrastructures regionally;
- coordinate the marketing of regional products;
- develop and implement agritourism products and services in a targeted manner to complement the tourism offerings in the region.

Funding for regional development projects as part of agricultural policy requires an inter-farm and regionally coordinated approach. This regional process strengthens the competitiveness of businesses in the valley along the entire agricultural, food and tourism value chain. The resulting economic dynamism creates sustainable jobs. And such jobs are the prerequisite for maintaining a decentralised settlement in the long term.

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[1] For further information on spatial patterns of population dynamics in Switzerland, see Federal Office for Spatial Development (2023), see: <https://www.are.admin.ch/are/fr/home/developpement-et-amenagement-du-territoire/bases-et-donnees/observation-du-territoire/bevolkerung-gesellschaft/repartition-geographique-de-la-population.html> (in French only), accessed: 06.12.23.

[2] Federal Constitution of the Swiss Confederation, see: <https://www.fedlex.admin.ch/eli/cc/1999/404/en>, accessed: 06.12.23.

[3] For a comprehensive overview on the Swiss agricultural policy cf. the official website of the Federal Office for Agriculture (FOAG), <https://www.blw.admin.ch> , accessed: 06.12.23.

[4] More information on public spending for different agricultural funding schemes is available on a yearly basis online, see: <https://agrarbericht.ch/de/service/dokumentation/download-center>, accessed 06.12.23.

[5] Particularly, for products from mountain and summering areas, an official sign exists, see: <https://www.blw.admin.ch/blw/fr/home/instrumente/kennzeichnung/berg-und-alp.html> (in French only), accessed: 06.12.23.

[6] Detailed information on the funding scheme for projects for regional development is provided by FOAG, see: <https://www.blw.admin.ch/pdr/> (in French only), accessed: 06.12.23.

[7] Discover the project at: <https://www.grand-entremont.ch/fr/accueil/>, accessed: 06.12.23.



## **Annex 5 Depopulation in the Abruzzo municipalities**

By Assunta Lisa Carulli, Domenico Di Spalatro, Alessandro Valentini, Istituto Nazionale Statistica

The population decline, the so-called demographic winter, is a very relevant question, especially in the internal areas of Italy. The phenomenon of depopulation has undergone several changes over the years with different tools adopted to oppose it such as: the operational financing of social cohesion instruments and the tendency to promote the aggregative processes of functions and services. For some years Italy has been attending the phenomenon of depopulation, mainly linked to a decline in birth rates. In the meanwhile, internal areas are characterized by continuous outflows of population essentially linked to inequalities in the socioeconomic development. Inequalities between the different areas of the country are due to the attraction of demographic contingents towards urban areas or more economic developed areas and the repulsion towards other less urbanized areas with consequent different possibilities of access to essential or useful services or to more acceptable living and working environments in numerous municipalities. This phenomenon is particularly relevant in the South of Italy and in the various settlements of the Apennines mountains, including municipalities of Abruzzo. In Abruzzo migratory outflows are mainly associated with families of young age and with high working capacity which over the years have led to a pauperization of human capital as the reduction in the birth rate and an accelerated ageing population in the origin places. To contain the drain of population from smaller towns, the region Abruzzo has issued the regional law n. 32/2021 to revitalize the social and economic structure of small mountain municipalities subjected to depopulation and at the same time to promote its recovery and economic development.

For the purpose of this law, “small mountain municipalities” have been classified on the basis of UNCEM data (National Union of Municipalities and Mountain Authorities). With a population of less than 3000 inhabitants in which a demographic decline is higher than the regional average recorded over the last five years and all mountain municipalities with a population of up to 200 inhabitants even in the absence of demographic decline.

The aim of this work is to identify new socio-demographic and economic dimensions of depopulation in Abruzzo and to develop them through appropriate statistical analysis in order to support the local policy strategies aimed at contrasting this phenomenon.

The information base for the analysis is structured on a set of municipal indicators, classified in 6 different thematic areas: 1. demography (3 indicators), 2. society (3 indicators), 3. employment (3 indicators), 4. economy (3 indicators), 5. services (3 indicators), 6. environment (3 indicators). All data are taken from official statistical sources, mainly Istat (Time period is 2019 and 2021).

The first area (demography) is structured on indicators that highlight both the structural (% of population under 14 years) and the dynamic component (rates of birth, death, migration).

Indicators of the second area (society) are of social nature and consider the incidence in the most significant age groups, family composition, educational qualification, commuter flows.

Indicators of employment area define the occupational renewal, the weight of NEETs, activity rate and unemployment rate among young people.

A fourth area, the economic one, includes various indicators related of the productive system (average size of local units of enterprises, value added per employee, remuneration per employee), as well as the size and distribution of net income.

Indicators of the service area take into account the incidence of accommodation services (hotel and non-hotel) on the territory and those related to the person. Finally, indicators of the sixth area (environment) are more specifically linked to the physical characteristics of the territory: the level of seismicity, the danger from landslides, and the hydraulic hazard.

The set of indicators is synthesized using the Adjusted Mazziotta - Pareto Index (AMPI) in order to build a classification of municipalities on the basis of the greater or lesser fragility generated by the demographic, socio-economic and environmental contexts. The analysis was realized in two steps: i) for mountain municipalities; ii) for all the municipalities of the region. A ranking of the mountain municipalities (classified under the regional law n.32) was elaborated with the highest level of AMPI index that show greater fragility. This ranking has remained unchanged after the inclusion of municipalities not covered by the regional law.

Therefore, the set of indicators is robust and easily explains the phenomenon of depopulation. In the period 2019-2021, the main factors in the worsening of depopulation and in the changes of the positions of municipalities in the ranking are mainly due to the rate of death, the unemployment rate of active people and the danger from landslide. The analysis extended to all municipalities ended with the study of the spatial autocorrelation of the AMPI index in the 4 provinces of Abruzzo and the application of the Moran index to all municipalities of the region.

Table 1 - Spatial autocorrelation of AMPI+ Index

<i>Provinces</i>	<i>Moran Index AMPI+2019</i>	<i>Moran Index AMPI+2021</i>
L'Aquila	0,35	0,30
Teramo	0,66	0,82
Pescara	0,75	0,85
Chieti	0,36	0,23

The components of depopulation appropriately identified and summarized through the AMPI index make it easy to identify both the territories subjected to depopulation and the potential ones at the light of a multivariate set of components such as social, economic, and environmental aspects. The values of the spatial autocorrelation of Moran index show a different level of territorial connection of the AMPI index in the various provinces of Abruzzo that could imply different dynamics of depopulation or repopulation not still emerged. Results are part of an information system whose scope is to support local policies aimed at contrasting demographic decline.

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# **Annex 6 Lifestyle farmers: Who, why and what impact? Exploring new entrants to mountain agriculture in western Austria**

By Bernhard Grüner, Institute of Geography, University of Innsbruck

## **Introduction: research significance and questions**

Increasing affluence promotes rural lifestyles and mobility's that are not economically induced. Primarily urbanites are seeking a "better quality of life" by a temporary or permanent relocation to the countryside. This trend has already been highlighted by a variety of rural studies (e.g. Corrado et al., 2014; Graf, 2021; Gretter et al., 2019; Grubbström & Joosse, 2021; Halfacree, 2022; Kordel et al., 2018; Membretti et al., 2022; Moss, 2006); in single cases also in Alpine periphery (e.g. Beismann et al., 2022; Löffler et al., 2016; Steinicke & Löffler, 2014).

In the Austrian Alps, there is a lack of studies on spatial and, even more so, social lifestyle mobility's. The research project "newcomers in high mountain areas of the Austrian Alps" funded by the Austrian Science Fund (FWF)<sup>3</sup>, addresses these blind spots (e.g. Grüner, 2023; Grüner & Konzett, 2022; Konzett & Grüner, 2022).

This article provides insights into new entrants to Alpine farming (cf. Grüner, 2023; Konzett & Grüner, 2022) and therefore focuses on both the social and spatial dimension of lifestyle mobility (Benson & Osbaldiston, 2014; Cohen et al., 2013; McIntyre, 2009). In detail, it responds to the following questions:

- 1) Who are these new entrants (in German: Quereinsteiger:innen)?
- 2) Why are they entering mountain agriculture?
- 3) What is the impact of their farming on rural space and society?

Following the European Innovation Partnership for agriculture (EIP-AGRI, 2016), new entrants are actors who, in contrast to family farmers, have not grown up in agriculture.

## **2 Case study regions and methodology**

The mainly qualitative fieldwork was carried out in the Montafon and East Tyrol (both Austria) and, for spatial comparison, in the neighbouring Vinschgau (South Tyrol, Italy).

All three study regions are rural mountain areas with a low population density and large distances to urban centres. Between the years 2020 and 2022, 24 semi-structured interviews were conducted with new entrants. As entering mountain agriculture from scratch is not a mainstream phenomenon, identifying new entrants proved to be more complex than originally assumed. However, interviews with 18 experts in the field of agriculture, politics, tourism and spatial planning as well as desk research in online media and blogs facilitated the recruitment of new entrants.

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<sup>3</sup> Project website: <https://www.uibk.ac.at/en/geography/projects/newcomers/>

## **Key findings**

### **Who are these new entrants?**

The interviewed new entrants show a relatively high level of education, i.e. a degree from a secondary school or university. Most of them have entered agriculture in the last 13 years. In addition, the majority of new entrants grew up in or returned to the respective case study region. Contrary to expectations, only a small number migrated from other parts of Europe – mainly Germany.

Most of the new entrants were initially employed in the service sector or in industries or still work there part-time. They sideline in sectors such as health, finance, engineering and construction, media, hospitality, retail or law. With their off-farm employment, new entrants match the majority of family farmers in the study regions who also derive parts of their income from non-farming activities.

Interestingly, although as per definition new entrants did not grow up on a farm, three of them had chosen agricultural training long before they decided to take over a farm.

### **Why are they entering mountain agriculture?**

As an expression of lifestyle mobility, new entrants are in the quest for a „better“ or at least „different“ lifestyle, which they hope to achieve through farming. The label “lifestyle farmers” is thus apt.

Interview data demonstrates that new entrants’ search for a better life is triggered by either individual or systemic crises. On the one hand, the desire for mental and physical health is one possible route into mountain agriculture. On the other hand, it is the critique on contemporary consumerism and the agri-food industry. In detail, the new entrants hope to regain control over food production and consumption through self-sufficiency.

### **What is the impact of their farming on rural space and society?**

From a quantitative perspective, new entrants manage only a third less agricultural land than an average farm at federal/provincial level. Therefore, new entrants cannot be considered “hobby farmers”. Nevertheless, this trend is largely neglected by rural communities and agricultural policies. This is reflected either in the mistrust of family farmers towards an extra-familial farm transfer and, especially in Austria, in strict land transfer laws. Both pose major obstacles for new entrants’ land tenure.

While the focus of new entrants is self-sufficiency, many of them are already developing direct and online marketing. The agricultural structure of new entrant farms is small-scaled and concentrates on arable farming, horticulture or the breeding of small livestock, such as sheep, goats, pigs, geese or lamas. As the comparison of the three study regions reveals, new entrants consciously oppose the regional predominant farm management, represented by intensive livestock breeding and dairy farming (Montafon and East Tyrol) and intensive fruit growing (Vinschgau).

In addition, new entrants’ farming shows tendencies of (retro-) innovation (Kluvankova et al., 2021; Neumeier, 2012; Zagata et al., 2020): On the one hand, the investigated new entrants reintroduce begone species and practices that were once typical in the region but overrode by the mechanization of agriculture. On the other hand, they experiment with new techniques and species based on organic agriculture and beyond.

Of course, there are innovative family farmers in the case study regions. However, farming practices and attitudes ingrained over generations may hinder family farmers from immediately changing the existing farm management. While family farms in the case study regions usually represent residence

and production sites, new entrants tend to open their farms and practices to a broader society, including the rural community per se and scientific institutions. This is particularly evident in the Vinschgau and, can re-establish the villagers link to agriculture – also among rural youth.

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## **Annex 7 Training and research to prevent mountain depopulation: the Institut Agricole Régional experience**

By Michele Sigauco, Institut Agricole Régional, Aosta

Institut Agricole Régional is a foundation that carries out technical and vocational education, training in agriculture, but also research and experimentation in mountain farming.

Training for operators in mountain territory can be a way to improve the economic and environmental sustainability, to develop a multifunctionality of the activities carried out, that gives the possibility to remain to garrison a territory. Therefore, agriculture could become a focal point to attract tourist flows essential to ensure the permanence of populations in the mountains.

In this context, the role of rural activities is of high importance for the production, care, and use of the landscape, the maintenance of traditional social structures, and as a multifunctional basis for other economic sectors.

Thanks to many projects in which it has participated as a partner or as a leader, the IAR has developed excellent skills in the management of this subject:

Project RestHAIP Enhancing and strengthening ecological habitat restoration projects in the Alps.

Projet PITEM CLIP Circuit: supporting the innovation capacity, competitiveness, and sustainability of the most strategic sectors of the cross border.

Project LIFE PASTORALP Pastures vulnerability and adaptation strategies to climate change impacts in the Alps: e

Project RESERVAQUA Implementation of a network of study services, the protection, and enhancement, land sustainable management of WATER at local and regional level on a cross border Alpine territory

Project TYPICALP TYPicity, Innovation, Competitiveness In alpine Dairy Products: strengthening the competitiveness of MPMI active in the dairy sector in Valle d'Aosta and Canton Valais

The project For.Me.Mò, originates from the requirement for cross border training systems to respond to the needs of the labor market with flexible, individualized training proposals and responsive to the mobility needs of operators, especially in the Alpine area.

The FORMEMO project worked on mountain crafts and culture to enhance the professional heritage of the Alpine territories of the ALCOTRA area. It aims to redevelop the mountain area from the point of view of professionalism present in it to make them capable of giving benefit to the territorial heritage. The objective was also to fill a gap in the field of vocational training through a joint and synergistic design of training courses aimed at enhancing the skills of people who already live and work in the Alpine territories. The aim was to work synergistically on the formation of mountain professions whose profiles are capable of integrating professionalism in tourism with multi-active skills (especially in rural and mountainous areas that are more dependent on the seasonality of tourist flows).



**ANNEX 2 – Report of 2<sup>nd</sup> Workshop - Circular economy and smart technologies for mountain agriculture and forestry: an overview of the current trend in the Alpine countries**

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# **CIRCULAR ECONOMY AND SMART TECHNOLOGIES FOR MOUNTAIN AGRICULTURE AND FORESTRY: AN OVERVIEW OF THE CURRENT TREND IN THE ALPINE COUNTRIES**

*Report of the second thematic Workshop of the  
Working Group Mountain Agriculture and  
Mountain Forestry of the Alpine Convention  
Online, 22.03.2024*

**Organized by the members of the Italian Delegation of the Mountain  
Agriculture and Mountain Forestry Working Group (MAMF)**

Simonetta Mazzarino and Giorgio Matteucci, Chairs of the Working Group

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# 1. THE TOPICS OF THE WORKSHOP

Circular economy and smart technologies represent new production paradigms for companies operating in any sectors where they can be applied. Circular economy aims to reduce the uptake of natural resources, to make their use more efficient and sustainable, in order to leave them available to next generations. Moreover, the circular economy also represents a new consumption model through the re-use of products already used but repaired and regenerated, so still usable.

The need to move from a linear to a circular economic model represents a response to some worrying trends at the global level, linked to the not infinite availability of some materials, the price volatility for some resources and the expected new consumers by next decades, which may push the demand for goods and services to unseen levels. So, the European Union considers these issues as very relevant, and they are indicated as important levers of action within the Green Deal. In this respect, consistent funding will be available for companies implementing these new production methods, both among the Common Agricultural Policy funds and the structural and investment funds.

Smart technologies are the new trend in the agriculture and forestry sector, aiming to transform the traditional techniques towards innovative solutions based on smart data collection and on modern Information and Communication Technologies (ICT). They give the opportunity to farmers and forest managers to have very different set of tools, techniques, and strategies at farm and forest stand level, unthinkable until 20 years ago. So today farmers and foresters can make decisions, depending on the collected data, adapting their cultivation and production choices to the different conditions induced by climate, climate change, diseases, insect attacks, and so on. The same approach can be applied to cattle and sheep ranging, with ad-hoc per capita feeding and drug dosing.

The systematic use of ICT and sensing technologies in agriculture has a few benefits. As we will see in this workshop, smart farming allows us to collect information in real-time about conditions of crops or animals, allowing a proper dosage of chemical inputs to their real needs. This has a very positive effect on the environment and on the ecosystems hosting agricultural and forestry activities, with advantages for the biosphere and biodiversity, and the protection of pollinators and birds. In addition, a dosage tailored to the specific needs of crops or cattle provides a higher quality in the agricultural production, thanks to fewer residues of pesticides, fertilisers and medicines. These techniques support farmer's income also by reduced costs connected to chemical inputs. Finally, they allow the farmer to operate in a healthier working environment.

The biggest challenge is to make these new techniques available and implementable even to small family-run farms and small forestry businesses, operating in mountain contexts.

The purpose of the workshop report is to try to understand to what extent and with which strategies it is possible to increase the implementation of virtuous economic choices and smart technologies to reduce the impact and increase production of agricultural and forestry activities in Alpine environments.

## 2. OVERVIEW

On March 22, 2024, the second thematic workshop on the topic "*Circular economy and smart technologies for mountain agriculture and forestry: an overview of the current trend in the Alpine countries*" took place on-line. The workshop was organized by the Members of the Italian Delegation of the Working Group Mountain Agriculture and Mountain Forestry (MAMF) of the Alpine Convention. In total 35 people participated.

### Objectives of the thematic Workshop

This second thematic workshop contributes to two different objectives of the current mandate 2023-2024 of the Working Group (objectives 2 and 4), focused on:

**Obj. 2** - *Understand new opportunities for mountain territories in terms of: agricultural and forestry productions and management approaches that favour or are already in line with ecological transition and circular economies; sustainable agricultural and forestry productions that allow to recover abandoned areas; initiation and development of Alpine districts.*

**Obj. 4** - *Evaluate the introduction of technical (e.g. low-impact management techniques) and technological innovations (e.g. smart farming/forestry and precision farming/forestry) in small and medium sized farms and forest activities targeting a good balance of innovations and traditional practices, an efficient use of inputs and favoring reduction of greenhouse gases emissions or increase in GHG sink.*

The aim of the workshop was focused to the circular economy and the new digital technologies that can be applied in the management of mountain agriculture and mountain forestry. The basic idea was to get an overview of state of implementing of these practices in the Alpine countries, in order to:

- show new opportunities for local economic development and ecosystem safety;
- underline possibly innovation to be applied also to traditional practices and to promote an efficient use of inputs;
- present and discuss good examples and practices of new production paradigms in the Alpine Countries.

### 3. ABSTRACTS OF PRESENTATIONS

#### **New technologies for smart farming in mountain areas: challenges and perspectives**

By Davide Ricauda, Department of Agricultural, Forest and Food Sciences (DISAFA), University of Turin, Italy

##### **Theme and good practices presented**

Agriculture has seen an unprecedented progression in the evolution of land processing and fertilization techniques, and crop protection over the last century. But the most important evolution occurred with the development of "smart farming", precision agriculture and Agriculture 4.0. Different types of technologies coexist today under these different expressions, often integrated among them: the use of sensors for crop monitoring and machine monitoring, and the use of drones to collect data. All these different technologies contribute to improving working conditions for farmers and to reduce the impact of agricultural activities on the environment.

##### **Different reasons to adopt smart farming technologies**

- Reduction in chemical inputs use and environmental impact: the presence of sensors and complex data processing systems allows the operating speed of the machines to be adapted to the canopy, and by dosing the chemical inputs in the quantities actually necessary;
- Reduction in human labour needs: the automation of many work phases reduces the need to carry out many phases with human labour in the field, making agricultural work less tiring, a particularly important aspect for the younger generations;
- More wellbeing and safety for farmers: farmers are less exposed to the toxic effects of chemicals;
- Costs reduction and better profit: less use of chemical inputs and hours of human work mean lower production costs, although it should be underlined that the implementation of these technologies requires investments in machines and IT systems for data processing, as well as specific skills to be transmitted to farmers.

##### **Good practices and future prospects for their transfer and implementation**

The biggest challenge for implementing these new technologies in the Alpine areas concerns the small size of the farms and the working conditions in which farmers must work (small plots with difficult access, narrow spaces, and steep slopes), making it challenging to automate vehicles. Furthermore, the agricultural machines market does not consider the possibility of offering small machines designed for these conditions.

Nevertheless, many research groups are studying innovative solutions in operating conditions that differ from those in intensive agriculture. Some examples of small machines are therefore proposed for some crops, including vineyards (more profitable, and thus able to better absorb the high initial costs), and machines for harvesting vegetables (vegetables and medicinal plants), completely electric that reduce polluting emissions into the atmosphere.

# **Remote sensing Technology and decision support System to support sustainable forest management in mountain areas**

by Francesca Giannetti, Department of Agriculture, Food, Environment and Forestry (DAGRI), University of Florence, Italy

## **Theme and good practice presented**

In the Alpine areas forests play distinct roles, not only linked to the provisioning of different materials (timber, food, animals), but also for regulating the ecosystems and the soil protection. An important environmental role is on biodiversity and landscape. Forests mitigate climate change (they represent important carbon sinks and a natural filter to contrast pollution), they improve the characteristics of water and air. Finally, they are important from a social point of view because they support the local economy (particularly relevant also for EU). The surface of forests in Europe has been expanding for over 30 years, up to 17 million of hectares. In the alpine territory, forests cover 50% of the territory.

## **Reasons to support circular economy in forestry**

The EIP-Agri support the circular economy in the forestry sector because it offers good opportunities linked to:

- preserving natural capital through renewable resource flows;
- reusing of wood material and waste from wood industry;
- improving the quality and design of materials;
- reducing waste and environmentally harmful practices;
- encouraging interaction and collaboration between different production sectors.

Forests are therefore producers of important ecosystem services. So, the EU Forest Strategy 2030 integrates with the EU Biodiversity Strategy, the EU Soil Strategy and become an important part of the Green New Deal.

## **Future prospects for the transfer and implementation of good practices**

To ensure their complex functions and to provide correct management, forests must be strongly monitored through collecting specific quality and quantity indicators (species present, forest structure, pest attacks, timber harvesting and timber quality, carbon storage in the trees, heavy metals stored in the leaves), to understand the health status of forest systems biodiversity, wood and non-wood production. All these information are important to understand the forest dynamics, and to make informed decisions.

Innovative technologies can be used today to collect and interpret data. Multispectral remote sensing allows to collect a lot of data from distance, using satellites (for example Copernicus, ESA-Sentinel-2, Landsat), airplanes or drones that detect a wide range of bands of electromagnetic radiation (visible, near-infrared, mid-infrared, thermal infrared). Moreover, through big data processing – on data provided by different platforms and sensors – and Artificial Intelligence we can extract information and indicators particularly useful to understand the temporal trend in



forestry, so to support decision making for forest managers, policy makers, urban planners and other stakeholders.

Some examples have been given regarding the possibility of:

- understanding if a forest is stressed by drought, insects, windstorm or fire;
- monitoring the forest health or density through a proper vegetation index;
- performing a forest inventory and mapping (with updates every year);
- monitoring land erosion and land degradation;
- monitoring forest disturbances through proper algorithms;
- monitoring biodiversity conservation;
- analyzing risk assessment and mitigation;
- sharing data (available at different level) through platforms for a correct forest management (by owners, users, administrators, policy makers, different stakeholders), also in the case of fragmented forest properties.

## **The ISAR Project: A comprehensive approach to the circular economy within the wood-based bioeconomy**

By Stefan Torno, Cluster Forst und Holz in Bayern – Germany

### **Theme of the project presented**

Waste wood is an important secondary source of raw materials but its re-use is insufficient: 80% of it is used for energy and only 20% is for material use, with a very small contribution to the circular economy, the carbon storage, the climate and environment protection. Different reasons hinder the efficient use of wood waste, in particular the logistics, the technologies, the structure of the value chain, the life cycle assessment, the adopted business models, the consumer interest and acceptance.

### **Project Structure**

The project “Innovation network for material use of waste wood at regional level – ISAR” has several objectives, including the development of a new use of wood waste (up to now used as a raw material for obtaining biomaterials for construction), the verification of the proposed innovation in real laboratories, the creation of an implementation roadmap within a pilot area (Bavaria). Three different goals have been developed in the project:

- preserve the use of wood residues in the solid state to obtain a finished product;
- develop a chemical digestion process of wood residues to obtain raw material for biorefineries;
- evaluate the potential of wood residues as a substrate for mushroom cultivation.

### **Prospects for the transfer and implementation of the good practice**

The Project is an example of how industrial wood waste can find various alternative uses by identifying the appropriate chemical processes that allow it to be valorised and reused. Its results are already applied in Germany, to show that the market sensibility already exists. Nevertheless, a roadmap for transferring the results obtained in practice will be developed, as well as for transferring the process into other regions. The involvement of various actors of the wood supply chain, high-level stakeholders and research institutes will be fundamental.

More information is available in annex 2.

## **SatGrass: satellite-based estimation of grassland yield and forage quality**

By Andreas Schaumberger and Andreas Klingler, Agricultural Research and Education Centre (AREC), Raumber-Gumpenstein - Austria

## **Theme of the project presented**

Pastures are a critical land use system in alpine areas, characterized by different intensities in the use (even within one farm), diverse site conditions, small-scale structures, and multiple harvests in each growing season. These factors complicate the systematic assessment of pasture yield and forage quality. As pastures mature, biomass increases while forage quality decreases due to continued plant growth.

It is important for farmers to know when it is the best time to harvest the grass as well as to understand if a change in the species present in the pasture is taking place due to exogenous factors, in particular due to climate change.

## **Prospects for the transfer and the implementation of the good practice**

The project shows the potential of integrating data from different sources and of different nature. The availability of information (from experimental data and remote sensing data) on hay collected at various sites spread across Austria, cross-referenced with climate data (temperature, radiation, evapotranspiration, precipitation and water balance), allows the development of predictive models that indicate the best time to cut grass, in order to optimize yield and forage quality (in terms of dry matter and protein). The defined models also allow to define the number of cuts that can be made in the various regions and in different sites (plain, mountain, hill; arable land, grassland).

These models can be applied at individual plot levels, on individual farm levels, and at regional and trans-regional levels, with different purposes. The main challenge is to transfer the method to farmers. They need to acquire the skills to pick up the data (that are freely accessible), use the models and get operational guidelines that can help them optimize their farm management.

Developing an operational system that integrates these models with intuitive interfaces is essential to translating these insights into practical tools for farmers and farming organizations. Future efforts will focus on creating the necessary IT architecture for such a system and adapting the model for application in other Alpine countries.

More information is available in annex 3.

## **Multi-sensor and multiscale approach to monitoring pests and diseases in mountain agriculture**

By Abraham Mejia-Aguilar, Center for Sensing Solutions, Eurac Research - Italy

## **Theme and good practice presented**

In South Tyrol, Italy, significant changes in alpine farming practices and the proliferation of forest pests pose challenges to ecosystem health and human well-being. Anthropogenic activities and economic factors have transformed cultural and traditional alpine farming, leading to a various land use, and to intensified agricultural practices. These changes include deforestation, excessive use of fertilizers and pesticides, and altered climate patterns, so crops are now more vulnerable to pest infestations. The main problems are related to fungal species, such as *Alternaria* on apple

orchards, and some endemic insects, such as the pine processionary, the bark beetle and the European cochineal, that devastate forests.

### **Prospects for the transfer and the implementation of the good practice**

Advanced remote sensing techniques are employed to address these challenges. These technologies use drones equipped with optical sensors that capture crop high-resolution images from above (orthomosaics) and analyze reflected colors in the visible spectrum. The analysis of the coloration allows us to evaluate the intensity of the pests' attacks on both crops and forests, the monitoring of the pest life cycle on individual trees, and the type of stress in the crops. The availability of spectral and thermal data enables targeted interventions for disease management and forest conservation.

Some examples are illustrated in relation to attacks of flavescence dorée on the vine and pine processionary nests on the forests. The vulnerability of territories to these attacks is accentuated by climate change.

It should be emphasized that data collection and processing are time-consuming and, therefore, costly processes. Now these methods cannot find direct application at the farm level, but rather at the level of wider areas, to understand the development stage of parasites and implement tailored pest' control actions.

More information is available in annex 4.

# **Farm mushroom production and its role in the circular economy in the preparation of a quality fertilizer suitable for organic cultivation. An example of good practices for agriculture in Slovenia**

By Tomaž Langerholc, Associate Professor and Vice-dean University of Maribor, Faculty of Agriculture and Life Sciences - Slovenia

## **Theme and good practice presented**

Primary agricultural production and food industry generate waste, such as wood and straw. Because they remain unprocessed, they must be deposited and represent an environmental burden and cost. The aim of the project is to use this waste material as a substrate for growing ligno-cellulose degrading mushrooms for the production of food and feed, as well as to use the spent substrate as a fertilizer.

## **Opportunities**

This is a good example of circular economy, focused on edible mushrooms (gen. *Pleurotus*) which are natural decomposers and low water consumers, important for the environment sustainability. This practice is applicable at the farm level. A part of the tests (evaluation of mushroom production and of the effects of the spent substrate as fertilizer on tomato crops) were conducted within different farms. The spent substrate seems to be a good source of phosphorus, it does not differ from other fertilizers and it increases the soil microbioma compared to a conventional fertilizer. From this practice of re-using of organic waste farmers can get new chances of work and more income. The environment gets an advantage in terms of fewer by-products to dispose of, therefore less pollution and better sustainability of agro-industrial production.

## **Prospects for the transfer and implementation of the good practice**

The mushroom production involves the preparation of the organic substrate (adequately pasteurized, inoculated with the mycelium, and prepared in special bags), phases to be realized outside the farm. At the farm level the cultivation must be located in proper buildings (good ventilation and lighting, air conditioning), monitored (temperature and humidity control, clean rooms) and harvested every day. After mushrooms cultivation, the spent substrate can be used as natural fertilizer for organic or biodynamic agriculture.

This practice's strength is that the substrate's cultivation and reuse phases involve farms. It determines, on the one hand, the entry of a new production process in the management, with a potential good complementary income if farms manage to activate correct commercial channels; on the other hand, a saving on farm fertilization costs. However, it is necessary to have at the farm level premises (suitable or made such) for the growth of mushrooms.

More information is available in annex 5.

# Smart Exploitation of Byproducts from Alpine Agricultural and Forestry Supply Chains

By Federica Zabini e Francesco Meneguzzo, National Research Council of Italy - Institute of BioEconomy – Italy

## Theme and good practice presented

Hydrodynamic cavitation is a physical process in a liquid when it is forced along a hydraulic circuit provided with suitable constrictions. The example presented uses the technique that associates one or more hydraulic pumps with a Venturi tube, through which a liquid containing biomass from food waste is passed. The constriction through which the liquid is passed generates microenvironments characterized by locally very high temperatures, intense pressure waves, and hydraulic microjets able to extract different substances from the biomass contained in the liquid, (micronutrients, bioactive compounds, acceleration of enzymatic reactions, creation of emulsion, etc.) depending on the biomass type. This practice is also an example of a circular economy linked to the exploitation of organic by-products from the agricultural and forestry sectors.

## Opportunities

The supply chains potentially involved are linked to agriculture, agroindustry and forestry, in all their phases. The yields are much higher compared to other extraction processes (from 1.3 times up to 35 times more). Furthermore, the working scale of the plant can be much smaller than conventional extraction plants.

A first example presented is related to the use of wood from European chestnut (*Castanea sativa*) supply chain, for the extraction of tannin, used in different contexts (wine-making, animal feed, leather industry, soil amendment). In this context the hydrodynamic cavitation represents a non-conventional way of extraction, more suitable for a small scale (for example a single sawmill) than conventional methods, which instead require large quantities of chestnut wood byproducts, much longer times and much more energy consumption. Other presented examples linked to the forestry sector concern the use of conifer by-products (e.g., from maritime pine, silver fir and spruce) to obtain aqueous solutions containing antioxidant, antimicrobial, and antiviral principles, that can be used as health supplements, food or in cosmetics.

The fruit sector has also good potential for reusing waste. A project is currently underway in collaboration with an important association of apple producers with trials to recover apples waste. Crucial aspects of the project are on the one hand the understanding of the chemical characteristics of the waste and the identification of possible innovative products (extracts, bioactive principles), on the other the construction of pilot plants and the verification of the feasibility of the recovery process at the medium and small level.

## Prospects for the transfer and implementation of the good practice

The prospects of small-scale use are interesting but clearly require investments in specific machinery and good skills. Currently, the application remains confined to operators downstream of farmers and foresters. It is however an excellent example of the reuse of organic by-products. These waste reuse processes at various levels in the agricultural and forestry supply chains make the food and wood industries more efficient, sustainable and resilient.

More information is available in annex 6.

## **Collaborative forest economy in Carnia: the NET.Fo project and the Forest sharing approach to leverage sustainable forest management of fragmented forest properties**

By Erika Andenna and Sara Di Menna, Consorzio dei Boschi Carnici – Italy

### **Theme and good practice presented**

The NET.Fo Project was carried out in the Alpine area of Carnia, in Friuli Venezia Giulia, Italy, with the financing of European funds. The context is related to the ownership of the forests, which in the study area are partly private and partly public, with a very high fragmentation of the ownership (a widespread condition in the Alpine context) and the tendency to abandon the fragmented forest stands. Other characteristics of the area are the lack of planning and the low timber stock utilization, especially from private ownerships. The lack of forest management determines a greater fragility and vulnerability of forests, which is further accentuated in the presence of extreme events (such as Vaia Windstorm) due to climate change. These forest conditions accentuate the effects of attacks by parasites, mainly insects, which are the secondary cause of the depletion of the forest heritage.

### **Opportunities**

Forest sharing in Alpine communities represents a good opportunity for private smallholders because it allows to create value from abandoned stands, gives the opportunity to find a solution for highly fragmented forest properties, and develops the opportunity to make public bodies and private owners working together. But a correct and shared forest management is an opportunity also for the community which can benefit from the ecosystem services of the forests. So, on the bases of the collaborative economy, the Project tried to develop a strategy to involve smallholders in forest management and product use through the creation of a network to connect private and public owners.

### **Prospects for the transfer and implementation of the good practice**

The project used an existing sharing economy platform, developed in another region, adapting it to the characteristics and problems of the chosen pilot areas. Private owners can freely and voluntarily join the platform, inputting a series of data relating to their stands (for example, insect attacks, problems with fallen plants, etc.), allowing them to study targeted actions of controlled cutting or attack containment measures, with obvious advantages in terms of cost reduction. This model is flexible and can therefore also be exported to other territorial contexts.

For the success of projects of this type, the "bottom up" involvement of local communities is fundamental through a series of initiatives (entertainment activities, workshops, municipal meetings) to create a network among all possible interested stakeholders in the management and use of the woods.

More information is available in annex 7.





## 4. DISCUSSION AND CONCLUSIONS

Circular economy, collaborative economy, agriculture 4.0, and smart farming and forestry represent different and complementary ways to manage agricultural and forestry production processes in a more effective and environmentally friendly way. The diffusion of these models in the Alpine areas is still limited. However, their wider application is necessary to increase the income at the local level, safeguard and strengthen the value chains of traditional products, and improve the attractiveness of the territories, not only in terms of tourism.

The workshop gave a broad overview of what science and new forms of participatory economy can offer to Alpine territories and their communities to achieve the objectives mentioned above, which are the basis of the quality of life of the populations living there.

The circular economy (presented in the workshop through new forms of reuse of waste from the wood industry) allows different supply chains to increase the value produced, thanks to the production of various types of products (but in some cases also of ecosystem services) that extend the supply chain itself, increasing its added value. This practice is particularly interesting for the Alpine territories if it is easily manageable within individual owners, thus offering new income opportunities and a better ecological impact of the supply chain itself. The possibilities of reusing by-products can also be extended to the agricultural sector, in particular with the recovery of by-products from livestock farming (leather, wool, horns) used to obtain hand-made products (leather products, yarns, fabrics, clothing, carpets, buttons, products for rustic furniture), which fit very well into mountain living contexts and are of great appeal for tourists.

The collaborative economy is another crucial and interesting topic for the Alpine territories, characterized by small and highly fragmented agricultural and forest properties. Therefore, there are problems in managing production processes that, if carried out individually, are onerous in terms of organization and costs. The example presented regarding the shared management of forests by a plurality of owners (private and public) is very topical because with climate change, extreme weather events, and increasingly massive attacks by insects and parasites, the forest heritage of many Alpine areas risks collapsing, with severe damages to the territories (impossibility of using wood, risk of landslides and fires, landscape that changes radically, ecosystems distorted in their balances). The success of these forms of shared management requires intense animation and involvement of operators "from below", highlighting that shared management is a "win-win" model, capable of economic valorisation of forest resource for the advantage of each owner and at the same time capable of maintaining in the long term a resource with ecological and strategic value for the entire local community. The example presented also shows a notable flexibility of adaptation to different territorial contexts, characterized in some cases by the unavailability of forest owners (because they died or moved abroad and are no longer interested in managing the forest).

Agriculture 4.0 and smart farming represent the future of agricultural production process management. The possibility of using probes and sensors applied to agricultural machinery to identify parts of crops affected by phytosanitary problems or nutrient deficiencies, now allows for the automation of treatments and fertilizations where necessary, diversifying the extent of treatments. Farmers can save hours of labour and costs in the chemical inputs used, but it also allows crops to have a reduced impact on the environment and human health (consumers and farmers). Therefore, from the perspective of ecological transition, these are necessary transformations for the agricultural sector. Studies and tests have privileged intensive lowland agriculture, characterized by large regular surfaces on which these machines can already be used. Much less has been done for mountain environments, characterized by much more irregular, small, and sloping surfaces, and often with difficult access, requiring smaller machines. Drones could be a solution in this type of context. Still, it will take time for these machines to be available for Alpine farms at accessible costs and directly manageable by farmers, given the necessary technical skills. Companies specifically equipped to

provide phytosanitary and fertilizing services aimed at small mountain companies could represent a temporary solution.

Finally, the availability of data of various types (spectral information in the visible and invisible spectrum) from satellites and remote sensing systems such as the Copernicus system already allows today, but even more so in the future, to carry out monitoring on large portions of territory, to verify the presence of problems of various types (extensive attacks by insects or other phytosanitary problems on forests, movements of attacks, changes in vegetation cover over time due to drought and climate change, etc.). It is the latest technological frontier available today but is already able to offer the interpretation of complex phenomena and suggest possible solutions. The interpretation of the data is not within the reach of individual farms but requires the intermediation of operators on a larger territorial scale (public agencies and institutions, universities, research institutes, private consortia). However, the solutions offered again require cooperation and coordination between public and private entities, as in the case of the shared economy. Thus, in applying the solutions suggested by public bodies, large and small individual farms once again become the key to the success of the identified actions.

In mountain and Alpine contexts, where the aggravating factor of depopulation and aging of local populations has been occurring for decades, there is an absolute need to involve the younger generations and support them with adequate tools and skills. For this reason, training and accessibility to technological tools such as the Internet and broadband access are and will be strategic objectives to allow local Alpine communities to create business and territorial management models tailored to the challenges of the ecological transition.

## 5. ANNEXES

### Annex 1 Agenda of the workshop

Agenda item	Timing
<b>Login on Zoom platform* and work opening</b>	09:00-09:15
<b>Welcome and introduction into the event</b> 6. Simonetta Mazzarino, University of Turin and Giorgio Matteucci, National Research Council of Italy (CNR), Chairs of the MAMF Working Group 7.	09.15-09:30
<b>"Setting the scene" – Circular Economy and smart technologies in Alpine countries</b>	9:30 – 10:45
<b>New technologies for smart farming in mountain areas: challenges and perspectives</b> Davide Ricauda, University of Turin, Department of Agricultural, Forest and Food Sciences	9:30 – 9:50
<b>Remote Sensing technology and decision support System to support sustainable forest management in mountain areas</b> Francesca Giannetti, University of Firenze - Department of Agriculture, Food, Environment and Forestry (DAGRI)	9:50 -10:10
<b>a. Coffee Break</b>	10:10 – 10:30
<b>b. "Spotlights" – Best practice and Projects from the MAMF Countries</b>	10:30 – 12:10
<b>The ISAR Project: A comprehensive approach to the circular economy within the wood-based bioeconomy</b> Stefan Torno, vom Cluster Forst und Holz in Bayern - Germany	10:30– 10:45
<b>SatGrass: satellite-based estimation of grassland yield and forage quality</b> Andreas Klingler, Agricultural Research and Education Centre Raumberg-Gumpenstein - Austria	10:45 – 11:00
<b>Multi-sensor and multiscale approach to monitoring pests and diseases in mountain agriculture</b> Abraham Mejia-Aguilar, Center for Sensing Solutions, Eurac Research - Italy	11:00 – 11:15
<b>Farm mushroom production and its role in the circular economy in the preparation of a quality fertilizer suitable for organic cultivation as an example of good practices in the field of agriculture in Slovenia</b> Tomaž Langerholc, Associate Professor and Vice-dean University of Maribor, Faculty of Agriculture and Life Sciences - Slovenia	11:15 – 11:30
<b>Smart exploitation of Byproducts from Alpine agricultural and Forestry Supply Chains</b> Federica Zabini e Francesco Meneguzzo, National Research Council of Italy	11:30 - 11:45

- Institute of BioEconomy - Italy	
<b>Collaborative forest economy in Carnia: the NET.Fo Project and the Forest sharing approach to leverage sustainable forest management of fragmented forest properties</b> Erika Andenna e Sara Di Menna, Consorzio dei Boschi Carnici - Italy	11:45 – 12:00
<b>Question Time &amp; Final Discussion</b>	12:00 – 12:30
<b>Closing of the workshop</b> Simonetta Mazzarino and Giorgio Matteucci, Chairs of the MAMF Working Group	12:30– 13:00

## **Annex 2 The ISAR Project: A comprehensive approach to the circular economy within the the wood-based bioeconomy**

By Stefan Torno, Cluster Forst und Holz in Bayern – Germany

The development of the bioeconomy suggests a greatly increased use of wood by both current and new players. As the supply of waste wood is expected to grow in medium to long terms it is supposed to be an interesting secondary feedstock in addition to wood coming from forests. However, due to several obstacles to the efficient use of waste wood the biggest part is used for energetic purposes so far with a very small contribution to climate and resource protection, carbon storage and higher added value. The research project „ Innovation network for material use of waste wood at regional level (ISAR)“ aims to unlock the potential of alternative feedstocks by creating an innovation concept for the optimized circular utilization of waste wood (research phase) and its validation by real-world laboratories (implementation phase) in Bavaria. Thereby, a transformation roadmap will be developed, which presents optimization potentials and precise measurements for the implementation of the concept in practice as well as transfer possibilities into other regions. Current and future supply and material flows of waste wood will be assessed and modelled dynamically, value chains including logistics will be optimized and three exemplary innovation pathways will be developed. Additionally, the project will focus on the development of business models, life cycle assessment and market and consumer acceptance of the innovation pathways and their products, respectively.

## **Annex 3 SatGrass: Satellite-based estimation of grassland yield and forage quality**

By Andreas Schaumberger and Andreas Klingler, Agricultural Research and Education Centre (AREC), Raumberg-Gumpenstein - Austria

### **Introduction**

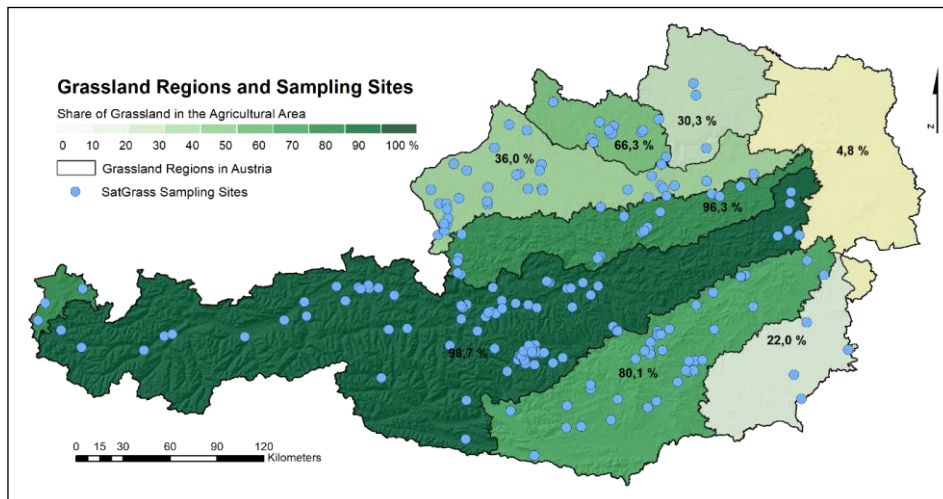
Grassland is a critical land-use system in alpine areas, characterised by varied intensities of use, diverse site conditions, small-scale structures, and multiple harvests each growing season. These factors complicate the systematic assessment of grassland yield and forage quality. With the maturation of grassland, there is an increase in biomass while the quality of forage declines a consequence of continuous plant growth. Providing near-real-time, objective evaluations of these variables prove challenging for even experienced professionals, yet is vital for improving grassland management strategies.

Furthermore, ongoing monitoring of yield and quality on a regional scale serves as a tool for statistical analysis, informs agricultural policy and advisory services, and supports risk management efforts. The rising threat of drought, exacerbated by climate change, underscores the need for accurate, site-specific yield assessments to aid in effective climate response and mitigation strategies.

## Methodology

The SatGrass project combines remote sensing, climatic, and grassland data to develop and validate models for estimating yield and forage quality across 211 sites in Austria (see Figure 1). We monitored growth bi-weekly on these sites during the growing seasons from 2020 to 2023. We analysed 12,063 samples from selected plots and evaluated their botanical composition and leaf area index, resulting in 15,610 AccuPAR measurements.

Figure 1: Austrian grassland regions and their intensity of use with SatGrass sampling sites



After processing the harvested samples, we analysed 4,021 bulk samples for dry matter yield and forage quality, including crude protein content. Our approach to determining the start of the growing season integrates remote sensing data with temperature thresholds, while a novel cut model, utilising Sentinel-2 imagery and a machine learning-based NDVI curve, accurately predicts harvest times. Our yield and quality prediction models employ machine learning techniques, utilising weather and Sentinel-2 vegetation indices as inputs.

## Results

The models are tailored to reflect the diversity of grassland management practices in Austria, demonstrating robustness and unbiased performance across different systems and regions. They accurately predict yield and crude protein content, with a yield determination coefficient ( $R^2$ ) of 0.75 and 0.65 for protein estimation. With a mean absolute error (MAE) of four days, the cut model enables precise cut detection and intensity classification, facilitating biodiversity assessments in extensively used fields. By analysing the relationship between dry matter yield and forage quality, the models assist in determining the best harvest times, incorporating weather forecasts to guide management decisions. The models support regional analysis, enabling comparisons and assessments of climate impacts, such as drought-related yield losses.

## Outlook

The SatGrass project has accumulated a comprehensive database of approximately 7,000 yield and cut date records, forming the base for models that detect the start of the growing season, grassland cutting times, yield and forage quality. Developing an operational system integrating these models with user-friendly interfaces and secure administration is essential to translate these insights into practical tools for farmers and agricultural organisations.

Future efforts will focus on creating the IT architecture necessary for such a system and adapting the model for application in other Alpine countries.

### **Project publications**

Klingler, A.; Schaumberger, A.; Vuolo, F.; Kalmár, L.B. and Pötsch, E.M. (2020): Comparison of Direct and Indirect Determination of Leaf Area Index in Permanent Grassland. PFG – Journal of Photogrammetry, Remote Sensing and Geoinformation Science 88 (5), 369-378.

Watzig, C.; Schaumberger, A.; Klingler, A.; Dujakovic, A.; Atzberger, C. and Vuolo, F. (2023): Grassland cut detection based on Sentinel-2 time series to respond to the environmental and technical challenges of the Austrian fodder production for livestock feeding. Remote Sensing of Environment 292, 113577.

Reuß, F.; Navacchi, C.; Greimeister-Pfeil, I.; Vreugdenhil, M.; Schaumberger, A.; Klingler, A.; Mayer, K. and Wagner, W. (2024): Evaluation of limiting factors for SAR backscatter based cut detection of alpine grasslands. Science of Remote Sensing 9, 100117.

Dujakovic, A.; Schaumberger, A.; Klingler, A.; Mayer, K.; Atzberger, C.; Klisch, A. and Vuolo, F. (2024): Growth Unveiled: Decoding the Start of Grassland Seasons in Austria. European Journal of Remote Sensing (submitted and accepted).

Dujakovic, A.; Watzig, C.; Schaumberger, A.; Klingler, A.; Atzberger, C. and Vuolo, F. (2024): Enhancing grassland cut detection using Sentinel-2 time series through integration of Sentinel-1 SAR and weather data (in preparation).

## **Annex 4 Multi-sensor and multiscale approach to monitoring pests and diseases in mountain agriculture**

By Abraham Mejia-Aguilar, Center for Sensing Solutions, Eurac Research, Italy

In South Tyrol, Italy, significant changes in alpine farming practices and the proliferation of forest pests pose challenges to ecosystem health and human well-being. Anthropogenic activities and economic factors have transformed cultural and traditional alpine farming, leading to land use alterations and intensified agricultural practices. These changes, including deforestation, excessive use of fertilizers and pesticides, and altered weather patterns, have rendered vegetation vulnerable to pest infestations. Fungal species such as *Alternaria* threaten apple orchards, while endemic pests like the pine processionary and European bark beetle wreak havoc in forests.

To address these challenges, advanced remote sensing techniques are employed. Unmanned Aerial Vehicles (UAVs) equipped with miniaturized optical sensors provide high-resolution multispectral imagery, aiding in the detection, identification, and quantification of pests in both agricultural and forested areas. UAV-based surveys, conducted throughout the pest life cycle, facilitate the identification of individual trees affected by fungal species in apple orchards and the monitoring of pest outbreaks in forests. Utilizing spectral and thermal data, unhealthy trees are accurately mapped, enabling targeted interventions for disease management and forest conservation.

By combining terrestrial monitoring approaches with UAV-based spectral data collection, a comprehensive understanding of pest distribution and impact is achieved. The integration of remote sensing products, such as Sentinel imagery, further extends monitoring efforts to broader geographic extents. This integrated approach not only enhances pest management strategies but also contributes to the preservation of ecosystem services essential for human populations. Through advancements in remote sensing technology, South Tyrol stands poised to mitigate the adverse effects of pest infestations and sustainably manage its agricultural and forest ecosystems.



## **Annex 5 Farm mushroom production and its role in the circular economy in the preparation of a quality fertilizer suitable for organic cultivation as an example of good practices in the field of agriculture in Slovenia**

Tomaž Langerholc, Faculty of Agriculture and Life Sciences, University of Maribor, Slovenia

Primary agricultural production and the food industry generate waste, such as wood and straw. As they remain unprocessed, they have to be deposited and represent an environmental burden and cost. The aim of the project was to use this waste as a substrate for the cultivation of lignocellulose-degrading mushrooms for the production of food and feed and to use the spent mushroom substrate (SMS) as fertiliser.

In order to achieve the objectives of the project, permanent mushroom production was set up on two farms. The lignocellulose-based waste generated on the farms was successfully converted into an effective substrate for the growth of edible and medicinal mushrooms. The composted SMS was passed on to three partner farms, where it was tested as a tomato fertiliser in a two-year field experiment. The quantity and quality of the harvest as well as the physico-chemical parameters of the substrate and the soil were monitored.

Farms can gain new opportunities for survival through mushroom production on the farm, create new jobs and, most importantly, promote the circulation of materials. As an organic fertiliser suitable for all farming systems (conventional, organic, biodynamic), SMS can be usefully integrated into the circular economy and the recycling of nutrients in the local environment. SMS helps to reduce the negative impact on the environment and can be integrated into green transition management in agriculture.

## **Annex 6 Smart exploitation of Byproducts from Alpine agricultural and Forestry Supply Chains**

Francesco Meneguzzo and Federica Zabini: Institute of Bioeconomy, National Research Council of Italy, Sesto Fiorentino (FI), Italy

Although abundant, geographically concentrated, and often rich in bioactive compounds, waste streams and byproducts of various agrifood and forestry supply chains are still underutilized or intended for disposal, due to the lack of reliable, affordable, effective, efficient, and scalable extraction techniques. The emerging green technique of hydrodynamic cavitation, using water and electricity as the only solvent and power source, respectively, efficient and straightforwardly scalable up to the commercial scale, has been used at the pilot and real scale for the extraction of natural products, among which byproducts from alpine agricultural and forestry supply chains, such as whole apple discarded from the market and apple pomace, and byproducts from forestry supply chains of spruce, silver fir, and chestnut. Substantially higher process yields were achieved, due to higher extraction rates and lower energy consumption (few tens to few hundreds of Wh per kg of fresh biomass), short process time (15 to 60 minutes), and moderate process temperature (up to 40 to 80°C). The integral phytocomplexes showed good to high levels of standardization, water solubility, and bioavailability, and included valuable polysaccharides, polyphenols, and volatiles. Remarkable antioxidant, antimicrobial, antiviral, and neuroprotective activities were observed *in vitro* and *ex vivo*. Moreover, tannins extracted from byproducts of the chestnut wood supply chain showed high technical value in applications to valuable vine seedlings in a controlled nursery. Hydrodynamic cavitation emerged as a technique enabling the bioeconomy of agrifood and forestry supply chains, with resulting products suitable for food enrichment, manufacturing of food supplements, and technical applications.

## **Annex 7 Collaborative forest economy in Carnia: the NET.Fo Project and the Forest sharing approach to leverage sustainable forest management of fragmented forest properties**

By Erika Andenna and Sara Di Menna, Consorzio dei Boschi Carnici – Italy

Forests and the forest sector play a significant role in a context of climate crises, as they contribute to reduce emissions, store carbon and provide a continuous stream of ecosystem services, including wood products, biodiversity conservation, clear air and water, recreation and many others. However, the benefits they provide can be compromised or lost altogether, as diseases, insects and other disturbances occur. We can say that the expression of such functions is strictly related to forest health and vitality, which rely on active, responsible forest management. Within this context, the project Net.Fo (Net of Forests) aims to overcome forest ownership fragmentation suggesting a new approach to collaborative economy, by building a strategy for involving small owners in active forest management and utilization. One of the aims is helping private, small-scale owners see the great opportunities behind the forest sharing approach, which leads to creating value from the active management of abandoned properties in alpine communities. The average holding size in the alpine regions is less than 1 hectare wide, and this extremely reduces the chances of successful and cost-efficient implementation of forest utilization. The great chance of NET.Fo is that public and private owners work together, in a sort of “virtual re-parcelling of land”, without losing any rights over it, rather reducing costs and increasing the chances of success for each management action. Moreover, the opportunity of being directed by a public administration, Consorzio Boschi Carnici, is a further guarantee of achievement. The project has been developed in Friuli Venezia Giulia region, at the very northeast of Italy. Despite the long tradition of Forest management over the centuries, mainly as a source of wood and for the family needs, the last decades have brought a progressive abandonment of such practices in private properties. Starting from an existing platform of sharing economy, developed by a spinoff of Florence University, what we actually did is commissioning a tailor-made platform, adapted to the local needs, enabling private and public forest owners to freely register and enter their properties’ data. Unlike the original one, the new platform includes an original module for the early-warning of bark beetle attacks, developed to implement a PLAN for monitoring the state of forests, based on the spatiotemporal analysis of multispectral satellite images. After the experimental phase, the unit will help detect a potential plague due to the insect, before it gets too far. The platform enables harvest planning within multiple ownership, getting “over the borders” and putting together the properties of those who signed in, creating at the same time the added value of reducing costs and sharing benefits. Animation activities were carried out during the whole duration of the project, in order to keep it alive and sharing it at a local scale. Meetings involving associations and municipalities, small events with stakeholders, workshops and webinars for professionals are the main tools implemented to promote engagement, enhance credibility and spread good practices

**ANNEX 3 – Report of 3<sup>rd</sup> Workshop - Peatlands and carbon farming, pastoralism, forestry and multifunctional activities in the mountains for the sustainability of the Alpine environment**

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# **“PEATLANDS AND CARBON FARMING, PASTORALISM, FORESTRY AND MULTIFUNCTIONAL ACTIVITIES IN THE MOUNTAINS FOR THE SUSTAINABILITY OF THE ALPINE ENVIRONMENT”**

***Report of the third thematic Workshop of the  
Working Group Mountain Agriculture and  
Mountain Forestry of the Alpine Convention  
Online, 21.06.2024***

**Organized by the members of the Slovenian and German Delegation of the Mountain  
Agriculture and Mountain Forestry Working Group (MAMF)**

## **Slovenia**

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Slovenija (Ministry of Agriculture, Forestry and Food of the Republic of Slovenia)  
Živa Bončina, Zavod za gozdove Slovenije (Slovenia Forest Service)

## **Germany**

Beatrice Wegener-Lange, Bundesministerium für Ernährung und Landwirtschaft (BMEL)  
(German Federal Ministry of Food and Agriculture)  
Raimund Becher, Claudia Kaulfuß, Wolfgang Wintzer, Bayerisches Staatsministerium für Ernährung,  
Landwirtschaft, Forsten und Tourismus (StMELF)  
(Bavarian State Ministry of Food, Agriculture, Forestry and Tourism)

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## 1. SUMMARY OF HIGHLIGHTS

The aim of the third thematic workshop of the Working Group Mountain Agriculture and Mountain Forestry (MAMF) during its mandate 2023-2024 was to discuss opportunities and trends regarding peatlands in the Alps in the context of carbon farming and climate change mitigation, as well as sustainable agriculture such as hay farming and forest ecosystem services.

First it was aimed at exploring how practices as carbon farming in the form of peatland restoration can contribute to mitigating climate change impacts while promoting sustainable agricultural and forestry practices in mountainous regions as well as enabling farmers to capitalize on these initiatives.

Secondly, the workshop tried to explore potential benefits of supply quality scheme for hay milk and hay meat. Concurrently, the workshop outlined the importance of preserving the traditional and cultural heritage deeply embedded in mountain agricultural production across the Alpine region.

The third topic of the workshop was related to forestry and focused on the project Forest EcoValue. This project emphasizes on the approach of sustainable eco-forest management systems, aiming to integrate practices that uphold forest health while maximizing ecological benefits. These practices encompass a broad spectrum of advantages that forests provide to ecosystems, ensuring their longevity for future generations.

In essence, the workshop has endeavoured to combine environmental sustainability with socio-economic considerations, seeking ways to empower mountain farmers while safeguarding their cultural heritage and promoting biodiversity. This initiative exemplified a comprehensive strategy to tackle the diverse challenges and opportunities confronting agriculture and forestry in alpine mountainous regions throughout the specified mandate of MAMF.



## 2. OVERVIEW

On June 21, 2024, the third thematic workshop of MAMF was held online. The topic was "Peatlands and carbon farming, pastoralism, forestry and multifunctional activities in the mountains for the sustainability of the Alpine environment". Members of the Slovenian and German delegation of the working group MAMF of the Alpine Convention organized the workshop.

### 2.1. Objectives of the thematic Workshop

**Objectives of the thematic Workshop and leading questions:**

#### **Agriculture: Carbon farming**

Peatlands in the Alps – status and perspectives for restoration, climate change mitigation and sustainable agriculture.

Questions

- Peatland soils (IPCC) are much more diverse than expected at first sight, especially peatlands under land use. Do we have a good overview?
- Key for maintenance and restoration of peatlands are people – especially land users! How to build bridges and bring them voluntarily into the peatland boat?
- Are the farmers convinced? How to support this very important land users (financially, advisory, etc.?)
- Economically viable follow-up land uses can motivate a lot. Paludicultures promise interesting new value chains. Successful examples for products and enterprises?

#### **Agriculture: Future role of mountain agriculture in sustainable food systems – HayMilk and Hay Meat**

Identification of opportunities for mountain farmers while preserving traditional and cultural mountain agricultural heritage closely linked with innovative supply quality scheme and biodiversity.

Questions

- The country's experience in promoting, supporting the production method of the Hay milk and Hay meat in the Alp region?
- The responsiveness of farmers (do they see this as an opportunity for higher prices, for biodiversity, etc.)?
- The consumer response (do they recognise the added value of hay milk products, are they willing to pay a higher price etc.)?

### **Forestry: Forest EcoValue, Alpine Space project:**

Identification of sustainable forest business models, to create a market framework and payment system for the forest ecosystem services.

#### Questions

- Identification of the needs for innovative policies to support forestry.
- Country's experiences in implementation of other joint activities in support of forestry.
- The responses and role of foresters and local actors to the proposed sustainable business models (circular, green and bio-based value chains in the forest-wood sector).

### **3. ABSTRACTS OF PRESENTATIONS**

In his introduction, Giorgio Matteucci referenced the 5th Report of the State of the Alps, adopted on 1 December 2022, which highlights the need for sustainable management and cooperation to tackle climate change, preserve heritage, and ensure resilience. Simonetta Mazzarino noted that the workshop's focus on multifunctionality in agriculture and forestry aligns with the EU's priorities since Agenda 2000. The COVID-19 pandemic has further underscored the importance of maintaining a healthy environment.

The **new Common Agricultural Policy (CAP)** emphasizes multifunctional production models to balance food production, environmental sustainability, and social benefits. During the current programme period 2021 to 2027, the Europe Union (EU) aims to address the multifunctional challenges. This holistic approach is crucial for fostering sustainable development, enhancing biodiversity, and supporting rural communities throughout the EU. In particular, **agricultural and forestry activities in Alpine and mountain regions are pivotal for environmental conservation**. The quality and healthiness of food produced in the Alps are enhanced by these practices, which thus **play a key role in maintaining a healthy alpine ecosystem, demonstrating the benefits of integrating multifunctional approaches in agriculture and forestry**. In addition to the CAP incentives, other opportunities for funding should be explored.

Blanka Bratol, representing the Slovenian presidency of the Alpine Convention, highlighted Slovenia's achievements during its fourth two-year term under the slogan "**Quality of Life in the Alps for All**," which emphasizes the future of alpine communities, biodiversity, and landscape diversity, while addressing climate change challenges.

The Slovenian presidency currently is finalizing preparations for the **18th Alpine Convention Conference, set for 22 January 2025, in Brdo pri Kranju, Slovenia**. The conference, under the slogan "**Quality of Life in the Alps for All**", will focus on enhancing alpine communities' quality of life, environmental education, and biodiversity conservation. The Slovenian presidency is in the final stages of preparing the results and outputs from the relevant thematic working bodies of the Alpine Convention on mountains, agriculture, and forestry. These bodies are encouraged to contribute and present their findings at the upcoming conference.

Three main reports are being prepared, currently at various stages of consultation, as to be finalized under the Slovenian Presidency: **the draft report on quality of life, the draft report on environmental education** with a focus on climate change, and **the draft Policy Brief on Biodiversity in the Alpine Convention 2024**. This brief focuses on key areas addressed by the MAMF Working Group and outlines critical issues and recommendations for safeguarding biodiversity in the Alpine region and the broader transnational environment. It also prepares the baseline safeguarding the global biodiversity framework.

Additionally, in **June 2024, the Alpine Biodiversity Conference was held in Kranjska Gora** with the central aim of gathering input for the Alpine Convention's Policy Brief on Alpine biodiversity. In addition, this Policy Brief will help pave the way for the development of an **Alpine Biodiversity Action Plan**, which is anticipated to be prepared during the upcoming Italian Presidency of the Alpine Convention.

An important meeting will be held on January 21, 2025, as part of Alpine Week 2024, at which the next Multiannual Working Plan of the Alpine Convention's Working Groups will be presented. Blanka Bratol also invited participants to **Alpine Week 2024**, which will celebrate its 20th anniversary from September 23 to 25, 2024 in Nova Gorica, Slovenia. The theme of the event is "The Alps in Our Hands," focusing on biodiversity, climate change and quality of life.

### **3.1 This report is essential for understanding the current state of Alpine soils and directing future efforts to sustainably manage and protect this vital resource. State of play: peatland protection in Germany**

*By Dr. Andreas Täuber, German Federal Ministry of Food and Agriculture (BMEL)*

Peatland protection is part of the Action Plan on Nature-based Solutions for Climate Protection (ANK) of the German Federal Ministry for the Environment (BMUV). Peatlands remove carbon dioxide (CO<sub>2</sub>) from the atmosphere and store it as organic carbon on the long term. Nature-based climate action combines climate change mitigation with nature conservation.

The BMUV has commissioned the Landwirtschaftliche Rentenbank as the project management organisation to draw up the main funding guideline named Palu 'Measures for the permanent and extensive rewetting of peatland used for agriculture and forestry' as part of the ANK and to implement area effective funding.

The content is currently being coordinated between the three named institutional bodies namely Landwirtschaftliche Rentenbank, German Federal Ministry for the Environment and German Federal Ministry of Food and Agriculture. The aim is to develop a final draft as quickly as possible for the start of departmental coordination.

The guideline Palu is intended to support agricultural and forestry businesses in adapting the management of rewetted areas. This includes (a) advisory services, (b) preparatory work such as feasibility studies or preliminary hydrological assessments, (c) investments to permanently raise water levels and adapt management (e.g. establishment of paludicultures) and (d) measures for the preparation of products (e.g. special technology for wet management).

With peatland protection, we at the BMEL want to work together with land owners and users to financially support rewetting on a voluntary basis, both as an investment in hydraulic engineering measures and as compensation for the necessary conversion of cultivation to paludiculture. We are supplementing this with a peat reduction strategy, which we have also initiated at EU level.

For this reason, the BMEL has been funding five model and demonstration projects (MuD) since 2023 in order to implement the planning, preparation and implementation of rewetting as well as the cultivation, utilisation and marketing of paludiculture products on a practical scale and thus enable nationwide transferability.

The BMEL funding projects aim to improve the implementation and economic viability of paludiculture. The BMEL is expected to have around 10 million euros per year at its disposal over a period of 10 years.

April 2024, the BMEL started the 'Alliance of Pioneers' initiative project, which aims to strengthen the demand side for paludi products.

## **4. SESSION 1 AGRICULTURE: CARBON FARMING**

### **4.1 Peatlands in the Alps, status and perspectives for restoration, climate change mitigation and sustainable agriculture**

*By Matthias Drösler, University of Applied Sciences Weihenstephan-Triesdorf,  
Peatland Science Centre (Germany)*

- Theme and good practice presented:

Peatlands as a special green infrastructure are today more important than ever - for climate protection and biodiversity, for the landscape water balance and for identification with the local area and tourism.

In the Alpine region there are many peatland areas due to precipitation, temperature and topography: Some are still in good condition, many have been modified (cultivated) in the past on the initiative of the state and all will have to cope with climate change in the future. Key factors for a good future are the improvement of the water balance and adapted sustainable utilization.

Heavily drained peatlands emit large quantities of greenhouse gases, which must - and can - be reduced. Corresponding climate and peatland protection strategies have therefore been implemented at EU level (the new Nature Restoration Law increases the urgency of fast and ambitious progress) and in many countries and regions. However, these face various hurdles during implementation and are accepted by the population in very different ways - new options for wet land use options increase the chances of implementation.

- Opportunities and/or Weaknesses:

Peatland rewetting with paludicultures has the highest GHG-mitigation potential of all LULUCF measures. Experiments in Freising (Bavaria) show a max. improvement

potential of more than 50 t CO<sub>2</sub>-eq per ha and year – plus C storage in peatland material products and substituted fossil CO<sub>2</sub> emissions.

Furthermore peatland rewetting shows significant co-benefits in biodiversity, water retention (in times of heavy rain) and water supply (in times of drought) as well as production of renewable materials and energies (photovoltaic) and as place for recreation and tourism.

Many land users see rewetting of peatlands as a non-reversible change of land use, that causes financial losses and costs. To motivate them for voluntary cooperation, dialogue on level playing field, tailor-made approaches, economic viable business models and complementary subsidy programs are therefore urgently needed, as well as innovative enterprises along the peatland material value chain (first products meanwhile available).

- Future prospects for the transfer and implementation of the good practice: An Alpine wide agenda on filling knowledge gaps, knowledge transfer, policy consulting and implementation was foreseen by project „RE-PEAT-it!“, but not approved by Alpine Space Program. New approaches are checked at the moment. Interested organisations are very welcome to get in contact.

## **4.2 Peatlands revitalisation in Scuol (Switzerland) - a joint project between farmers, NGOs and communities**

*By Angelika Abderhalden, Fundaziun Pro Terra Engiadina (Switzerland)*

- **Theme and good practice presented:**

Peatlands revitalisations are often associated with many conflicts, especially with agriculture. The case of a project for peatlands revitalisation in Scuol in Switzerland was presented.

- **Opportunities and/or Weaknesses:**

Cooperation's with farmers, municipalities, research institutions and regional nature conservation organisations helps to ensure that such projects can be carried out more easily and with close cooperation of involved parties. The advantages of peatlands revitalisation are manifold. Project results show that farmers can benefit from contribution and support by revitalisations of peatland as well as by contribution to increasing biodiversity and climate protection.

- **Future prospects for the transfer and implementation of the good practice:**

Protection of biodiversity, adaptation and mitigation of climate change, water regulation recreation, can be solved with appropriate intervention of the Peatlands

revitalisations. Strategic approach for closing the knowledge gaps for dissemination transnational peatlands complexes could be done by the project proposal ASP “Re-peat-it” or by a follow-up approach.

## **5. SESSION 2 AGRICULTURE: FUTURE ROLE OF MOUNTAIN AGRICULTURE IN SUSTAINABLE FOOD SYSTEMS – HAY MILK AND HAY MEAT**

### **5.1. Presentation of the Hay Meat and Milk quality scheme**

*By Polona Kolarek Novšek, Ministry of Agriculture, Forestry and Food of the Republic of Slovenia*

#### **o Theme and good practice presented:**

Hay milk production can provide economic advantages to farmers and thus help preserving mountain areas as well as have a beneficial impact on protection of natural resources and biodiversity. Hay milk commands higher market prices due to its superior nutritional profile, unique flavor, and higher purity compared to conventional milk. In Slovenia, traditional livestock farming methods, such as hay-fed meat and milk production without silage, is an opportunity for small mountain farmers. Financial incentives under the CAP, which have been available for hay farming in Slovenia, seemed to contribute to an increase of farmers producing hay milk and hay meat, also in mountains areas. Namely, the first incentive for promoting and informing farmers and consumers about hay milk was provided under Slovenian Rural Development Programme 2014-2020, namely for an EIP project. As of 2023, an operation Hay farming under the agri-environmental climate related measure in the context Slovenia's current CAP Strategic Plan is available. Due to high interest of farmers, the up-take of this operation by farmers exceeded the expectations.

#### **o Opportunities and/or Weaknesses:**

Production of hay milk according to the specification for the EU quality scheme “traditional specialty guaranteed” and currently production of hay meat under the national quality scheme support sustainable farming methods, improve animal health, leading to better meat quality, and promotes biodiversity, aligning with climate goals. These factors can help farmers sustainably manage their farms, ensuring the habitability and ecological integrity of mountain areas.

An increased production of hay milk without corresponding increased consumers' demand for hay milk and products made from hay milk could be a potential weakness.

#### **o Future prospects for the transfer and implementation of the good practice:**

In case of Slovenia, an assessment of the Hay Farming measure in the CAP Strategic plan for the 2023-2027 could be carried out, with a view to adjusting it if necessary. For consumers, more communication and publicity on hay milk and meat production would be beneficial for raising consumers' knowledge.

## **5.2 Hay milk: traditional milk production from permanent grassland in the Alpine region**

*By Heidi Trettler, ARGE Heumilch, Innsbruck (Austria)*

- **Theme and good practice presented:**

Modern hay farming with the use of technical aids for hay harvesting and especially for hay drying is an economically interesting variant of dairy farming in mountain areas. The project presented the modern hay farming of the permanent grassland of the mountain regions, which is managed in the form of pasture, alpine pasture farming as well as fresh grass feeding in summer and hay feeding in winter.

- **Opportunities and/or Weaknesses:**

Managing permanent grassland without ploughing, following the annual cycle, leads to significant carbon sequestration in the soil, surpassing that of arable land and commercial forests. Hay feeding benefits animals' health and embodies location-specific, environmentally and climate-friendly agriculture. This approach preserves biodiversity through mosaic-like grassland use, contributes to climate protection by storing carbon, conserves resources with limited concentrated feed use, maintains a high organic share (currently 38%), upholds high animal welfare standards, and strengthens rural areas.

- **Future prospects for the transfer and implementation of the good practice:**

Modern hay farming preserves mountain areas by offering economic advantages by utilising photovoltaic systems for hay drying, the farming method remains ecologically sustainable.

## **6. SESSION 3 FORESTRY: FOREST ECOVALUE, ALPINE SPACE PROJECT:**

### **6.1. Presentation of the Project Forest Eco Value and national pilot's actions**

*By Susanna Longo, Finpiemonte SpA, project coordinator (Italy) and Luca Cetara and Adriana May, Lombardy Foundation for the Environment, project partner (Italy)*

The ASP project Forest Eco-Value tackles a complex challenge, primarily due to the difficulty in defining the "value" of ecosystem services and the necessity to identify business and economic models tailored to the local context. Addressing this challenge requires an integrated approach that considers the complexity of natural systems alongside the socio-economic dynamics and needs of the involved stakeholders.

- **Theme and good practice presented:**

To validate the solutions proposed by the project, five living labs have been activated across the

different European territories involved. These Living Labs serve as real-world contexts in which to test and validate the models and tools developed by the project. They facilitate collaboration with local stakeholders to develop possible solutions and action perspectives.

- **Opportunities and/or Weaknesses:**

The five living labs under the Fores eco value addresses a different comparison of practices and solutions adopted in different frameworks enriches the available resources and helps develop more effective strategies in response to common challenges.

- **Future prospects for the transfer and implementation of the good practice:**

A set of conditions has been established to be assessed in the Living Labs, ensuring proper development of forest ecosystem services (FES) markets. Collected good practices from existing case studies of the Living Labs will support to assess the suitability of Living Labs for hosting innovative markets and payment schemes.



## 6.2. The best practices of the Forest EcoValue project in the Slovenian Living Lab

*By Živa Bončina, Slovenia Forest Service*

The ongoing Project ASP on Forest EcoValue through the European network of the five Living Labs aims is identifying public-private market models and enhancing green and circular value chains. The project tackles a complex challenge, primarily due to the difficulty in defining the "value" of ecosystem services and the necessity to identify business and economic models tailored to the local context.

A particular focus of the Slovenian Living Lab, located in the Alpine municipality of Tržič, addresses a subset of ecosystem services, including the provision of wood biomass for energy, protection against natural hazards through torrent management systems, and recreation and tourism.

### ○ **Theme and good practice presented:**

Forest EcoValue project addresses a subset of ecosystem services and have access to a broader range of knowledge and experiences. The Slovenian Living lab address the role of biomass, which supports local economies by utilizing readily available resources of biomass in Alpine region. Biomass fuels often consist of agricultural residues or wood by-products that would otherwise go to waste. Protective forest ecosystem services of forest are even more important in time of extreme climate events. Torrent management system reduces damages and increases safety. Tourism and recreation, connected with forests improve residents' well-being and increase business opportunities.

### ○ **.Opportunities and/or Weaknesses:**

Involving the five Living Labs serve as real-world contexts in which to test and validate the models and tools developed by the project. They facilitate collaboration with local stakeholders to develop possible solutions and action perspectives. The Living Labs in Slovenia presented that use of biomass for heating is sourced locally, supporting regional economies and reducing transportation-related emissions.

### ○ **Future prospects for the transfer and implementation of the good practice:**

Biomass heating plays a crucial role in the transition toward a greener Europe. By utilizing organic materials like wood pellets, chips, or logs, it significantly reduces greenhouse gas emissions compared to fossil fuels due to transport costs. First results from Living Labs shown that biomass actually aligns with a sustainable and environmentally responsible approach as biomass can be heating is carbon-neutral and minimizes waste.

## 7. DISCUSSION AND CONCLUSION

The speaker encouraged participants to contribute additional points for the final discussion, with a specific focus on the topics and questions outlined in the Programme. Key areas of discussion included peatlands, hay milk, and meat production sections. Emphasis is placed on addressing the issue of fragmentation and underscoring the importance of multifunctionality in Alpine agriculture and forestry field.

The discussion on peatlands tried to find additional answers to the guiding questions:

- *Peatland soils (IPCC) are much more diverse than expected at first sight, especially peatlands under land use. Do we have a good overview?*
- *Key for maintenance and restoration of peatlands are people – especially land users! How to build bridges and bring them voluntarily into the peatland boat?*
- *Are the farmers convinced? How to support this very important land users (financially, advisory, etc.?)*
- *Economically viable follow-up land uses can motivate a lot. Paludicultures promise interesting new value chains. Successful examples for products and enterprises?*

Overall, in Europe there are a lot of areas where the data on peatlands is very scarce, e.g. Italy and Slovenia. This data gap should be closed in order to get a good overview over peatlands in Europe and being able to use their potential.

**Peatlands** are getting more and more recognized for their role in carbon emission reduction. Nevertheless, the shift from drained to rewetted peatlands poses significant economic challenges for farmers. Here, paludiculture emerges as a potential pivotal new strategy, combining two primary objectives: reducing greenhouse gas emissions by rewetting drained peatlands and utilizing wetland plants like reeds or sedges for materials such as building insulation.

Germany faces the complex challenge of balancing peatland restoration efforts, encompassing approximately 1.8 million hectares, with sustainable land use practices to mitigate carbon emissions. This involves considering the economic viability of farmers who may need to transition their agricultural activities from restored peatlands to other regions. The German approach emphasizes the involvement of local communities, particularly farmers, whose land use decisions are critical for effective climate change mitigation strategies. The key will be to find better value chains to make valuable products. Farmers need sufficient planning security to plan and sell the products for a reasonable price.

Before implementing paludiculture systems on a larger scale, there is a call for additional pilot projects to establish production capabilities, ensure farmer participation, and guarantee a stable supply for companies utilizing paludicultural products. This evolving field witnesses numerous initiatives and ongoing projects across the North Alpine region (Germany, Netherlands, and Austria). These efforts aim to foster sustainable business practices and product development while safeguarding local economies and livelihoods.

Peatlands in Bavaria:

Even though there are potentially a lot of hectares of peatlands that could be restored, in some areas it might be more difficult than others. The rewetting of former moorland areas will not succeed everywhere, as these areas are often also home to settlements. Often these areas are also used intensively for arable farming. The best opportunities are found where peatlands are used for fodder production or litter production. Focus should be on areas that are easier to restore. It is also important to not forget farmers with the already degrading peatlands.

The EU Nature Restoration Law, which was adopted by Council only four days before the MAMF workshop, will probably lead to more urgency of progress on voluntary peatland restoration and thus to find appropriate strategies to motivate land owners to come on board. Member States, regions and Alpine Convention should make use of existing expertise and proposals, e.g. of the former project partners of RE-PEAT-it.

The second part of the discussion was devoted to the **hay-fed meat and milk production**. A question has been raised, if biodiversity element could be strengthened in the context of the presented CAP measure in Slovenia and if there is a risk of misleading consumers. Furthermore, participants enquired whether the Slovenian authorities plan to provide support only in the beginning, as sort of a start-up support. The presenter explained that the operation contains eligibility conditions that are related to the protection of environment and are as such also complemented requirements under conditionality. The implementation of the operation is programmed for the period 2023-2027 and an assessment of the Hay Farming measure in the CAP Strategic plan for the 2023-2027 could be carried out, with a view to adjusting it if necessary. During the discussion, the importance of the fodder quality was highlighted and the fact that the taste and the nutritional value of the hay milk is higher, which is particularly important for cheese production. With regard to the presentation by Heidi Trettler, ARGE Heumilch, it was explained that in Austria the contribution is paid by all farmers producing hay milk and all dairies that process hay milk. Considerable efforts are made for promoting and informing about hay milk. The CAP support is important, as well. As regards biodiversity, a set of rules is applied that requires for example mosaic mowing and artificial drying of hay is not problematic.

Overall, a key aspect emphasized is the importance of promoting biodiversity since it enhances the resilience of mountain ecosystems.

Central to the workshop's objectives is highlighting the role of Alps communities in preserving and restoring ecological services, a pivotal point for deliberation. The discussion **on forestry** is closely intertwined with the presentation of ongoing **Forest EcoValue project**, initiated in November 2022, which has already shown promising initial outcomes.

All five living labs in Five European countries: Italy, France, Slovenia, Austria and Germany represent the opportunities and resources of their respective territories, where new ideas and solutions can be developed, tested, and validated. They also provide a space for interaction between end-users and stakeholders, allowing everyone to play an active role in the transformation and innovation process. Additionally, they facilitate a participatory approach, enabling contributions that generate value and design solutions for the benefit of the community.

The recent discussions have centred on identifying the necessity for innovative policies to support forestry, exchanging experiences in joint forestry activities, and the role of forestry and

local stakeholders in proposing sustainable business models. Slovenia, as a project partner, is actively simplifying bureaucracy through **the e-forestry initiative project** on updating legislation. Additionally, critical areas for future development include sustainable forest management, climate change adaptation and mitigation strategies, research and innovation, as well as education and training.

**In Italy as a leading partner of the Forest EcoValue project**, various strategies are being employed to promote sustainable forest management and conservation efforts, leveraging financial support, taxation incentives, compensatory payments, and certification schemes like the Forest Stewardship Council (FSC). Carbon credits play a crucial role in mitigating climate change by incentivizing activities such as reforestation and sustainable forest management, which reduce greenhouse gas emissions. Italy is urged to enhance its forest quality through improved management practices and the utilization of carbon credits.

Nevertheless, a significant portion of Italy's forests, particularly in regions like Liguria, have naturally regenerated due to the abandonment of agricultural land, constituting over 90% of the forest cover. Although these forests may differ in composition and structure from their original state, they still provide essential ecosystem services and contribute to biodiversity conservation, akin to forests found in the Alpine region. Still some assessment or pilot model of management of such regenerated forest are still in the pre-modulating phase in Italy.

The Forest Eco Value project in Italy aims to assist forest enterprises in developing comprehensive, long-term plans. These plans aim to establish effective eco-forest systems based on reliable data and tailored legislation, ensuring sustainable management practices and environmental conservation. The project's primary focus is on enhancing forest management practices to ensure forests reach their full potential value. Payment schemes are integral, compensating forest owners or managers for providing ecosystem services or achieving environmental goals. The project aims to educate stakeholders on leveraging ecosystem services effectively through innovative tools and approaches, recognizing forests' multifaceted roles beyond wood production.

*In respect of the JRC science for policy report on use of woody biomass for energy production in the EU (discussion was focused on the silvicultural interventions and successful restoration of forests in Alpine region. In light of Woodford's insights on land abandonment and expanding forest cover, silvicultural interventions are essential for maintaining forest health and optimizing ecological benefits. However, the project emphasizes nature restoration, which involves rehabilitating forests while respecting their natural capacities and limitations. Important aspect is also transport of energy sources. If biomass from surrounding forests is used it accelerates circular economy. Successful restoration efforts acknowledge nature's resilience and adapt strategies accordingly. The JRC science for policy report on use of woody biomass for energy production in the EU: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://forestdefenders.eu/wp-content/uploads/2021/03/JRC-study-biomass-study-overview\_final.pdf*

Additionally, the Forest EcoValue project partners are planning a second upcoming technical meeting with relevant AG EUSALP groups, to update them on initial project outcomes, fostering ongoing collaboration and knowledge exchange in sustainable forest management practices.

## 8. ANNEES

### 8.1 Programme

Working Group Mountain Agriculture and  
Mountain Forestry (MAMF) of the Alpine Convention

#### ONLINE WORKSHOP

"Peatlands and carbon farming, pastoralism, forestry and multifunctional activities in the mountains for the sustainability of the Alpine environment"

21 June 2024, 9:00 – 13:00

*The workshop is being organised by the German and Slovenian Delegations of the Alpine Convention within the mandate of the Working Group Mountain Agriculture and Mountain Forestry (MAMF) of the Alpine Convention.*

Objectives of the thematic Workshop and leading questions:

**Agriculture: Carbon farming**

- o Peatlands in the Alps – status and perspectives for restoration, climate change mitigation and sustainable agriculture.

Questions

- o Peatland soils (IPCC) are much more diverse than expected at first sight, especially peatlands under land use. Do we have a good overview?
- o Key for maintenance and restoration of peatlands are people – especially land users! How to build bridges and bring them voluntarily into the peatland boat?
- o Are the farmers convinced? How to support this very important land users (financially, advisory, etc.?)
- o Economically viable follow-up land uses can motivate a lot. Paludicultures promise interesting new value chains. Successful examples for products and enterprises?

**Agriculture: Future role of mountain agriculture in sustainable food systems – Hay Milk and Hay Meat**

- o Identification of opportunities for mountain farmers while preserving traditional and cultural mountain agricultural heritage closely linked with innovative supply quality scheme and biodiversity.

Questions

- o The country's experience in promoting, supporting the production method of the Hay milk and Hay meat in the Alp region?
- o The responsiveness of farmers (do they see this as an opportunity for higher prices, for biodiversity, etc.)?
- o The consumer response (do they recognise the added value of hay milk products, are they willing to pay a higher price etc.)?

**Forestry: Forest EcoValue, Alpine Space project:**

- o Identification of sustainable forest business models, to create a market framework and payment system for the forest ecosystem services.

Questions

- o Identification of the needs for innovative policies to support forestry.
- o Country's experiences in implementation of other joint activities in support of forestry.
- o The responses and role of foresters and local actors to the proposed sustainable business models (circular, green and bio-based value chains in the forest-wood sector).

Agenda item	Timing
Login on Zoom platform* and work opening	08:45
<b>Welcome and introduction into the event</b> Simonetta Mazzarino, University of Turin and Giorgio Matteucci, National Research Council of Italy (CNR), <i>Chairs of the MAMF Working Group</i> Blanka Bartol, <i>Slovenian Presidency of the Alpine Convention</i>	09:00
<b>News from the Soil Working Group of the Alpine Convention</b> Giulia Gaggia, Permanent Secretariat of the Alpine Convention	09:15
<b>Activities of the German federal government for peatlands</b> Andreas Täuber, Federal Ministry of Food and Agriculture	09:20
<b>Peatlands in the Alps – status and perspectives for restoration, climate change mitigation and sustainable agriculture</b> Matthias Drösler, University of Applied Sciences Weihenstephan-Triesdorf, Peatland Science Centre (Germany)	09:30
<b>Peatland revitalisation in Scuol (Switzerland) – a joint project between farmers, NGOs and communities</b> Angelika Abderhalden, Foundation Pro Terra Engiadina (Switzerland)	09:50
<b>Presentation of the Hay Meat and Milk quality scheme</b> Polona Kolarek Novšek, Ministry of Agriculture, Forestry and Food of the Republic of Slovenia	10:10
<b>Hay milk: traditional milk production from permanent grassland in the Alpine region</b> Heidi Trettler, ARGE Heumilch, Innsbruck (Austria)	10:30
<b>COFFEE BREAK</b>	10:50
<b>Presentation of the Project Forest EcoValue and national pilots actions</b> Susanna Longo, Finpiemonte SpA, project coordinator (Italy) Luca Cetara and Adriana May, Lombardy Foundation for the Environment, project partner (Italy)	11:05
<b>The best practices of the Forest EcoValue project in the Slovenian Living Lab</b> Živa Bončina, Slovenia Forest Service, project partner	11:25
<b>Question time &amp; Final discussion</b>	11:45
<b>Closing of the workshop</b> Chairs of the MAMF Working Group	12:30

#### Moderation

Polona Kolarek Novšek, moderator from Slovenia  
 Beatrice Wegener-Lange, moderator from Germany

## **8.2 Annex (Contributions from the single speakers)**

### **8.2.1 Annex 1 Peatlands in the Alps, status and perspectives for restoration, climate change mitigation and sustainable agriculture,**

*By Matthias Drösler, University of Applied Sciences Weihenstephan-Triesdorf, Peatland Science Centre (Germany)*

The part of the presentation is summarized on the page 10 of the report.



## 8.2.2 Annex 2 Peatland revitalisation in Scuol (Switzerland) – a joint project between farmers, NGOs and communities

By Angelika Abderhalden, Foundation Pro Terra Engiadina (Switzerland)



UNESCO BIOSFERA  
ENGIADINA  
VAL MÜSTAIR

Summary of the presentation from, 21.6.2024, WS Mountain Agriculture and Mountain Forestry (MAMF) Working Group Alpine Convention

### Peatland revitalisation in Scuol (CH) – a joint project between farmers, NGO's and communities

Angelika Abderhalden, Dr.rer.nat, UNESCO Biosfera Engiadina Val Müstair, Fundaziun Pro Terra Engiadina

In Switzerland, the loss of peatlands since the first half of the 19th century has been around 90%. In addition to the loss of area, there has also been a loss in the quality of peatlands. This is despite the fact that peatlands and peatland landscapes in Switzerland have enjoyed a high level of protection since 1987. They are protected by the Federal Constitution.

In the past, 6% of Switzerland's surface area was covered by moorland; today it is only 0.7%.

Peatland revitalisation projects are often associated with many conflicts, especially with agriculture. In the Lower Engadine, canton of Graubünden, a moor revitalisation project was therefore planned together with the farmers from the outset. It is a 7.6-hectare peatland that is used for agricultural purposes as mowing meadows. It was drained in the 1940s and the aim is to rewet 3.7 ha.

The following diagram shows the duration of the revitalisation project as it was presented during the meeting.



Fig 1: slide 5 from the presentation during the WS MAMF, 21.6.2024)

The implemented measures were presented with the help of photos and plans included in the presentation. The advantages of peatland revitalisation are manifold. They contribute to an increase in biodiversity and quality as a recreational area. In addition, CO<sub>2</sub> savings can be achieved. Farmers benefit from contributions and support if management becomes more

difficult, as well as from the positive communication that they contribute to increasing biodiversity and climate protection through this project.

This example shows that cooperation with municipalities, research institutions and regional nature conservation organisations helps to ensure that such projects can be carried out more easily and with everyone's agreement.

Therefore, the conclusion shown in Fig 2 was presented.

### Conclusion – Alpine cooperation for peatlands is needed

- Protection of biodiversity, adaptation to and mitigation of climate change, water regulation, recreation, history → multifunctionality of peatlands
- Give individual initiatives more visibility and power
- Support local actors through transboundary cooperation and coordination (e.g. knowledge transfer, capacity building, political visibility, access to financing instruments, improvement of transnational biodiversity governance ...)
- Improving spatial connections towards spatial planning that thinks beyond borders.
- Strategic approach to closing the knowledge gaps for the dissemination of transnational peatland complexes -> projects as the ASP "Re-Pe-at-it!" could help to fill these gaps

Pro Terra Engiadina | 40000, 66000, 0240 | 01.02.2024

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Fig 2: slide 13 from the presentation during the WS MAMF, 21.6.2024)

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### 8.2.3 Annex 3 Presentation of the Hay Meat and Milk quality scheme

*By Polona Kolarek Novšek, Ministry of Agriculture, Forestry and Food of the Republic of Slovenia (Slovenia)*

As to discuss opportunities for mountain farmers, which preserve traditional and cultural mountain agricultural heritage, while being closely linked with innovative supply quality scheme and biodiversity, implementation of the Haymeat and Haymilk quality scheme in Slovenia was presented.

When a product is certified and labelled as Traditional Speciality Guaranteed (TSG), one of the food quality schemes at the EU level, it means that it is produced from traditional raw materials, it has a traditional composition or traditional recipe and production is not limited to a specific geographical area.

The names »Heumilch«/ »Haymilk«/ »Latte fieno«/ »Lait de foin«/ »Leche de heno«, as well as »Schaf-Heumilch«/ »Sheep's Haymilk«/ »Latte fieno di pecora«/ »Lait de foin de brebis«/ »Leche de heno de oveja« and »Ziegen-Heumilch«/ »Goat's Haymilk«/ »Latte fieno di capra«/ »Lait de foin de chèvre«/ »Leche de heno de cabra« are TSG. Slovenian producers, which comply with the respective product specifications, are allowed to use Slovenian names »seneno mleko«, »ovčje seneno mleko«, »kozje seneno mleko« since the year 2022.

The name *Haymeat*, for which similarly the ban of using fermented feed is one of the main requirements, was granted transitional national protection by the Slovenian Ministry of Agriculture, forestry and food in the year 2023 and the application for the protection as TSG at EU level was submitted.

In Slovenia, where agricultural land accounts for 33% of and is dominated by permanent grassland as well as areas with natural constraints (75%), cattle breeding represents the most important agricultural activity.

In promoting the production of Haymilk and Haymeat among farmers and consumers in Slovenia, an important role was played by European Innovation Partnership for agricultural productivity and sustainability (EIP) project »Seneno meso in mleko«, which was support under Rural Development Programme 2014-2020 between the 2018 and 2021.

A further step has been made by establishing an operation „Hay farming“ under the intervention „Agri-environmental-climate related payments for natural resources“ in the CAP Strategic plan for Slovenia for the period 2023 – 2027. By supporting the production of haymilk and haymeat, this new operation aims at ensuring a more diverse crop rotation on arable land (i.e. inclusion of other fodder crops in the crop rotation rather than mainly maize) and thus reducing nitrate loading to waterways and reducing the release of residues of plant protection products into the environment.

Farmers, who enter into the operation, have to obtain a certificate ensuring that production is found to comply with the product specification for haymilk, goat's or sheep's haymilk or the specification for haymeat and have to comply with other eligibility conditions (e.g. to have at least 1 ha of agricultural area and the average annual livestock stocking density (LU) between 0,3 and 1,8 LU of herbivores per ha and at least 2 LU of herbivores per holding). For the claim year 2023, farmers submitted aid applications for around 15.600 hectares (nearly one third of these farmers are located in the area of the Alpine convention.), thus considerably exceeding the planned target of 700 hectares for the year 2023. In the national register, 85 producers are verified for compliance with product specification for haymilk and 758 producers for hay meat. For comparison, only 10 farmers in Slovenia produced haymilk or haymeat when the mentioned EIP project regarding the ha milk and haymeat started at the end of 2018.

#### **8.2.4 Annex 4 Hay milk: traditional milk production from permanent grassland in the Alpine region**

*By Heidi Trettler, ARGE Heumilch, Innsbruck (Austria)*

Hay farming is the most original form of milk production in the Alpine region, which is increasingly threatened by the industrialisation of agriculture and international competition. Because of the cold and snowy winters in the region, fodder must be conserved for the winter in summer. Winter feeding with hay is particularly species-appropriate and the biggest difference between hay farming and other dairy farming systems.

The landscape basis for hay farming is the permanent grassland of the mountain regions, which is managed in the form of pasture, alpine pasture farming as well as fresh grass feeding in summer and hay feeding in winter. This management of permanent grassland without ploughing and according to the annual cycle causes a carbon sequestration in the soil that is much higher than in arable land and even higher than in commercial forest soil.

Hay feeding is not only healthy for the animals, but also represents a form of agriculture adapted to the location, which is very environmentally friendly and climate-friendly for various reasons:

- Preservation of biodiversity through mosaic-like grassland use
- Contribution to climate protection - permanent grassland stores carbon
- Limited share of concentrated feed conserves resources
- High organic share - currently 38%
- High animal welfare standards
- Strengthening of rural areas

Hay-milk farmers also voluntarily submit to a strict restriction on the use of concentrated feed. This, along with other regulations, is laid down in the hay-milk regulations. This also includes pasture and/or outdoor exercise on at least 120 days a year as well as fertiliser regulations. Fertilisation is mainly done with own manure from dairy farming.

Furthermore, within the framework of hay management, permanent grassland has the highest filtering effect regarding nitrate leaching due to a particularly high and dense root mass. Last but not least, small-scale/mosaic farming contributes significantly to the preservation of biodiversity.

Modern hay farming with the use of technical aids for hay harvesting and especially for hay drying is an economically interesting variant of dairy farming in mountain areas. By utilising photovoltaic systems for hay drying, the farming method remains ecologically sustainable. As the sun was used to dry the hay in the old times, it is still the best source for hay drying in a modern system.

### **8.2.5 Annex 5 Presentation of the Project Forest EcoValue and national pilots actions**

*By Susanna Longo, Finpiemonte SpA, project coordinator (Italy) By Luca Cetara and by Adriana May, Lombardy Foundation for the Environment, project partner (Italy)*

The Forest EcoValue Project is co-financed by the Interreg Alpine Space Programme 2021-2027 and brings together ten partners from five European countries: Italy, France, Austria, Slovenia, and Germany.

This three-year project aims to support the ecosystem services of Alpine forests by identifying public-private market models and enhancing green and circular value chains. The project tackles a complex challenge, primarily due to the difficulty in defining the "value" of ecosystem services and the necessity to identify business and economic models tailored to the local context. Addressing this challenge requires an integrated approach that considers the complexity of natural systems alongside the socio-economic dynamics and needs of the involved stakeholders.

To validate the solutions proposed by the project, five living labs have been activated across the different European territories involved. These Living Labs serve as real-world contexts in which to test and validate the models and tools developed by the project. They facilitate collaboration with local stakeholders to develop possible solutions and action perspectives.

We are currently developing a participatory process to jointly consider possible approaches and solutions to promote sustainable and beneficial forest management, and to validate economic and market models involving both the public and private sectors. A set of conditions has been established to be assessed in the Living Labs, ensuring proper development of forest ecosystem services (FES) markets. We have also collected good practices from existing case studies to assess the suitability of Living Labs for hosting innovative markets and payment schemes. An adjusted version of the business model canvas was used to shape business model archetypes for the FES chosen in each Living Lab.

To implement the new markets proposed by Forest EcoValue, the partners will involve policymakers from local, regional, national, and transnational levels in policy dialogues and forums. These interactions aim to identify concrete solutions and innovative policy instruments that can be adapted to specific contexts.

Through the European network of the five Living Labs and the partners of the Forest EcoValue project, this initiative enables access to a broader range of knowledge and experiences. This comparison of practices and solutions adopted in different frameworks enriches the available resources and helps develop more effective strategies in response to common challenges.

A particular focus will be on the Slovenian Living Lab, located in the Alpine municipality of Tržič. Here, the Forest EcoValue project addresses a subset of ecosystem services, including the provision of wood biomass for energy, protection against natural hazards through torrent

management systems, and recreation and tourism.

### **8.2.6 Annex 6 Presentation of the Project Forest EcoValue and national pilots actions**

*By Živa Bončina, Slovenia Forest Service, project partner (Slovenia)*

The Forest EcoValue Project is co-financed by the Interreg Alpine Space Programme 2021-2027 and brings together ten partners from five European countries: Italy, France, Austria, Slovenia, and Germany.

This three-year project aims to support the ecosystem services of Alpine forests by identifying public-private market models and enhancing green and circular value chains. The project tackles a complex challenge, primarily due to the difficulty in defining the "value" of ecosystem services and the necessity to identify business and economic models tailored to the local context. Addressing this challenge requires an integrated approach that considers the complexity of natural systems alongside the socio-economic dynamics and needs of the involved stakeholders.

To validate the solutions proposed by the project, five Living Labs have been activated across the different European territories involved. These Living Labs serve as real-world contexts in which to test and validate the models and tools developed by the project. They facilitate collaboration with local stakeholders to develop possible solutions and action perspectives.

We are currently developing a participatory process to jointly consider possible approaches and solutions to promote sustainable and beneficial forest management, and to validate economic and market models involving both the public and private sectors. A set of conditions has been established to be assessed in the Living Labs, ensuring proper development of forest ecosystem services (FES) markets. We have also collected good practices from existing case studies to assess the suitability of Living Labs for hosting innovative markets and payment schemes. An adjusted version of the business model canvas was used to shape business model archetypes for the FES chosen in each Living Lab.

To implement the new markets proposed by Forest EcoValue, the partners will involve policymakers from local, regional, national, and transnational levels in policy dialogues and forums. These interactions aim to identify concrete solutions and innovative policy instruments that can be adapted to specific contexts.

Through the European network of the five Living Labs and the partners of the Forest EcoValue project, this initiative enables access to a broader range of knowledge and experiences. This comparison of practices and solutions adopted in different frameworks enriches the available resources and helps develop more effective strategies in response to common challenges.

A particular focus will be on the Slovenian Living Lab, located in the Alpine municipality of Tržič. Here, the Forest EcoValue project addresses a subset of ecosystem services, including the provision of wood biomass for energy, protection against natural hazards through torrent management systems, and recreation and tourism.

