



Food and Agriculture  
Organization of the  
United Nations

Globally Important  
**AGRICULTURAL  
HERITAGE**  
Systems



# **TRADITIONAL HAY MILK FARMING IN THE AUSTRIAN ALPINE ARC**



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## I. TABLE WITH SUMMARY INFORMATION

Description of the agricultural heritage site	Sustainable hay milk farming in the Austrian Alpine Arc
Applicant organisation	ARGE Heumilch Österreich
Responsible ministry	Federal Ministry of Agriculture, Forestry, Regions and Water Management
Location of the region	Alpine Arc with Alpine foothills Mountainous regions from Vorarlberg to Tyrol and Salzburg and as far as Styria, as well as the Alpine foothills in Salzburg's Flachgau and Mondseeland regions and the Mühlviertel region
Accessibility of the location to the capital or to larger cities	The two largest cities in the region are the state capitals of Innsbruck and Salzburg: The nearest metropolis is Munich (2 hours by car from Innsbruck, 1.5 hours by car from Salzburg). Innsbruck and Salzburg each have their own airport, with Salzburg being better connected to the regions in Europe due to its topography. Salzburg is a traffic junction in the east-west as well as north-south direction (West Autobahn A1, Tauern Autobahn A10); Innsbruck is located on the Germany-Italy transit route (Inntal Autobahn A12, Brenner Autobahn A13).
Coverage area (expressed in ha) of the GIAHS site (core area and buffer zone, if applicable).	Core area: 148.473,14 ha
Agro-ecological zone for agriculture, forestry, fishery and aquaculture.	In general, the Alps limit the amount of usable land in the region. The sea level of the agricultural land is between about 400 and 1400 metres above sea level. Tyrol <sup>1</sup> : 61% of the agricultural land is alpine pasture and mountain meadow, 35% is meadow and pasture; Salzburg <sup>2</sup> : 96% of the agricultural land is permanent grassland Vorarlberg <sup>3</sup> : 55.5% of the agricultural land is Alpine pasture
Topographical features	The region is located at the eastern end of the Central Alps and at the transition to the Alpine foothills, with the landscape featuring mountains and valleys and hills in the Alpine foothills. Permanent grassland shapes the landscape between the valley floor and the forest. Above the timberline, Alpine pastures extend the economic zone.
Climate type	Alpine climate: warm summers with radiation weather (high-pressure weather with little cloud cover) and cold-air pools in winter; precipitation is distributed throughout the year, snow in winter
Approximate population	421.485 persons

<sup>1</sup> Statistik Austria, Agrarstrukturerhebung 2010 (via Website Land Tirol, <https://www.tirol.gv.at/statistik-budget/statistik/landwirtschaft/>)

<sup>2</sup> Moser, Franz: Grüner Bericht des Landes Salzburg 2016-2018, Salzburg 2019

<sup>3</sup> Amt der Vorarlberger Landesregierung: Strukturdaten Vorarlberg 2018; Bregenz 2018; p. 160

Traditional communities and/or indigenous populations (not applicable)	No specific ethnic groups
Main source of livelihood	Tourism, trade and commerce, industry Agriculture The region is characterised by tourism, which is particularly dominant in Tyrol, Vorarlberg and parts of Salzburg. However, the production sector is also an important source of both commercial and industrial revenue. Agriculture plays a minor role in direct added value, but also contributes significantly to tourism by preserving the landscape.

## II. SUMMARY

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 grassland 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.<sup>4</sup>

The proposed system is basically about feeding fresh grass and herbs in summer and hay in winter. This feeding method 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 (see proposal Chap. IV, 2).
- Contribution to climate protection - permanent grassland stores carbon (see proposal Chap. III, 3.2).
- Limited share of concentrated feed conserves resources (see "Higher basic feed performance", Chap. III, 3.2)
- High organic share - currently 38%
- High animal welfare standards (Chap. III, 3.2)
- Strengthening of rural areas (Chap. III, 3.2)

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

<sup>4</sup> Zollitsch Werner, Hörtenhuber Stefan., Lindenthal Thomas, Penicka Alexandra, Scheurich Anja (BOKU - Universität für Bodenkultur Vienna, Zentrums für Globalen Wandel und Nachhaltigkeit): Heumilchproduktion im Kontext der Sustainable Development Goals; Vienna 2019, p. 41f

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 with regard to 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. (see chapter Agro-Biodiversity).

Hay farming has been practised in the Austrian Alpine arc since the development of specialised agriculture at the beginning of the modern era. Up until the 1960s and 1970s, the majority of milk was produced as hay milk. In Austria, the share of silage-free milk was constantly high in Austria 85% until the 1970s. It was only after this that hay farming was increasingly pushed back. More and more dairy farmers converted their farms because silage farming seemed more profitable and more in keeping with the times. In industrialised dairy farming (silage farming), more and more concentrated feed is used, which occupies arable land in favourable locations (plate-trough debate). Hay milk, on the other hand, is produced from permanent grassland, which in many cases would not be usable for human nutrition.

In the mountain area, silage preparation was not an option, as it did not promise any advantage due to the small and steep areas.

## **1. PRESERVATION OF THE FARMING METHOD**

While the majority of milk in Austria was still being produced through hay farming until the 60s of the 20<sup>th</sup> century, today the figure is only 15%. Hay farming is feasible and practical wherever there is permanent grassland and winters are low in vegetation, especially in mountainous areas. Occasionally, there are smaller hay milk spots spread across Europe, but overall only about 3% of the milk in Europe is produced according to this system.

Hay farming is a form of agriculture that is optimally adapted to the conditions of the region, as small-scale farming structures make it possible to cultivate the often-steep slopes in a way that is suitable for the location. Over the centuries, the process has been adapted to the soil and climatic conditions of the mountainous region. Due to structural changes in dairy farming and climatic changes, hay farming is coming under increasing pressure.

The GIAHS region is intended to help preserve hay farming as a traditional and sustainable farming method. It assists in communicating the benefits of hay farming to consumers as well as to policy makers and administrators. Recognition as a GIAHS region will also be a great incentive for the preservation and sustainable further development of the farming method for hay milk farmers.

## **2. HAY FARMING AS A SUSTAINABLE OPPORTUNITY**

In 2019, the Center for Global Change and Sustainability at the University of Natural Resources and Life Sciences, Vienna, conducted a study assessing the hay milk production system in the context of the United Nations Sustainable Development Goals (SDGs).<sup>5</sup> The report looks at the sustainability of hay farming holistically according to environmental, social and economic issues. The goal should be to combine productivity and profitability with important elements of sustainability: site-appropriate milk production based on locally available resources (grassland) is just as much a prerequisite as animal-

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<sup>5</sup> Zollitsch et al., 2019

friendly husbandry practices with consistent pasture grazing in the summer period and high product quality. This will enable society and consumers to be involved in the sustainable development of grassland-based milk production. The statements made in the following text are taken from this report.

### **3. CHARACTERISTICS OF THE GIAHS REGION**

#### **3.1. Food and livelihood security**

Small, family-run farms have always shaped the image of the region. In addition to milk production, their work also contributes to climate protection and the meadow and Alpine grazing of the animals preserves the cultural landscape. What's more, family-run hay milk farms play an important role in terms of revitalising rural regions.

Likewise, the processing plants tie jobs to the region. With their high-quality products, the plants also make a major contribution to the region's food security.

#### **3.2. Agro-biodiversity**

Preserving biodiversity, different types of meadows and pastures as well as important wildlife habitats is an essential part of hay farming. That's why hay milk farmers rely on small-scale, mosaic farming.

To promote biodiversity, hay milk farmers allow their meadows and pastures to mature, mowing many areas only when a variety of grasses and herbs are at full seed maturity and biodiversity is at its greatest. This is an important criterion when it comes to pollination and the continued existence of a wide variety of plants; one to two cuts less per summer are even accepted for this purpose. Almost 1,000 different grasses and herbs grow in hay milk meadows.<sup>6</sup>

Mowing is done spaced out at different times. In this way, all green areas are never mowed at once and important food sources and retreats are preserved for bees, butterflies or small game.

Old breeds of cattle whose milk yield would be too low for industrialised agriculture are also preserved through hay farming. After all, for hay milk farmers, it is not only milk yield and meat quality that count, but also a certain cross-country capability, which is important when the animals are taken to Alpine pastures for grazing. As a result, smaller breeds are also systematically bred, which would be of little importance for industrialised agriculture.<sup>7</sup>

#### **3.3. Local and traditional knowledge**

Knowledge of hay farming is passed down from generation to generation. ARGE Heumilch is an organisation committed to the transfer of expertise and, above all, to the preservation of knowledge and the contemporary further development of the farming method.

The specific knowledge of hay milk farmers includes the different cuttings and their respective importance for the basic ration. Hay farming is characterised by a high proportion of manual labour in haymaking due to the mountainous location and often steeply sloping land. Knowledge about this is passed on from generation to generation and is just as important as the sustainable further development of haymaking and drying methods, which ARGE Heumilch is committed to.

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<sup>6</sup> see Annex 3, p.91

<sup>7</sup> see chapter IV. 0, p. 39f

The processing plants have decades - in some cases even centuries - of experience in the production of traditional cheese types and maintain this experience. Regional cheeses have evolved over the centuries and continue to be produced by processing plants.

#### **3.4. Culture, value system and social organisations**

On the one hand, the value system of hay milk includes traditional values such as customs, traditional costumes and old recipes. On the other, UNESCO World Heritage Three-Step Alpine Transhumance and the tradition of the return from Alpine pasture are also part of this.

What's more, the values of the hay farming industry are shaped by ARGE Heumilch. The hay milk regulation sets the rules for hay farming and continues to evolve.

#### **3.5. Features of the landscape**

The region is located in the mountainous area along the main ridge of the Alps, as well as in the lakeland region with a small structure at its foothills.





### III. IMPORTANCE OF THE PROPOSED SYSTEM

#### 1. SPECIFIC VALUES AND CHARACTERISTICS

The production of hay milk is as old as the keeping of dairy animals in Europe. Throughout the Alpine region, the use of hay as a nutrient-rich winter feed has been a key technology for centuries to get ruminants through the vegetation-less cold season, thus ensuring livestock as the livelihood of farming families. A form of farming has therefore developed over the centuries that uses available natural resources efficiently and preserves them over the long term.



Figure 1  
Traditional haymaking

Due to the industrialisation of agriculture in the second half of the 20th century, this form of dairy cattle farming was increasingly pushed back and a feeding system based on silage and concentrated feed (wheat, corn, soy) prevailed in Europe. In the mountainous regions of Austria and their foothills, however, traditional hay farming has been able to survive and today represents a sustainable system worthy of protection due to the sustainable farming of permanent grassland.

In hay farming, most of the feeding is done with grass in summer and hay in winter. The main difference compared to other production systems is that fermented feeds (silages made from grass or corn) are prohibited and the amount of concentrated feed is limited. *The roughage portion of the dry feed annual ration must be at least 75%, and 85% for organic hay milk. The grain ration must originate from Europe and must not be genetically modified in accordance with current legislation.* In the mountainous regions, the dairy animals are taken to Alpine pastures for grazing in the summer, while they are put out to pasture on the meadow in the flat regions such as the lakeland regions of the Alpine foothills. Hay milk farmers have been managing their farms according to ecological principles for more than 30 years.

### **1.1. ARGE Heumilch Österreich**

To preserve this farming method, family-run farms and private as well as cooperative processors have joined together to form the ARGE Heumilch Österreich community: an association that brings together all 6500 hay milk farmers and the renowned 60 hay milk processors in Austria. The organisation's mission is to preserve hay farming and communicate the benefits of this sustainable farming method so that a fair milk producer price can be obtained in the marketplace. Thanks to a wide range of sales promotion measures, over the past 15 years it has been possible to bring the entire hay milk industry into value-added marketing. Sales in 2021 amounted to about 520 million kg of hay milk, or 15% of the total milk volume in Austria. The organic milk share is 38%. In the European dairy market, the traditional form of milk production has become a niche and only 3% of the milk produced in Europe now meets hay milk criteria.

### **1.2. Hay milk regulation**

All members of ARGE Heumilch produce in accordance with the strict hay milk regulation<sup>8</sup>, compliance with which is checked by independent, state-certified inspection bodies. In addition to the feeding method, the hay milk regulation also governs fertiliser regulations and extensive animal welfare requirements. The main criteria are:

- No silage on the entire farm for all animals on the farm, all year-round
- Open stall and/or meadow/Alpine grazing or outdoor exercise at least 120 days a year
- Controlled GMO-free feeding
- Obligatory veterinary care contract

At the instigation of ARGE Heumilch, hay milk was awarded the EU TSG quality seal in 2016, thereby receiving legal product protection in the European Economic Area. In 2019, the entry for TSG goat's hay milk and TSG sheep's hay milk followed.

#### **Conventional and organic haymaking**

Hay farming is in itself already a very sustainable form of milk production. In Austria, conventional hay farming means that producers and processors adhere to the hay-milk regulations of ARGE Heumilch (see annex to the proposal). This includes, among other things, limiting the use of concentrated feed to a maximum of 25% of the annual ration and specifies what the concentrated feed may consist of. Fertiliser regulations are also part of the hay-milk regulation, as are animal welfare measures. The hay-milk regulations are regularly adapted to the requirements of the market.

Furthermore, 38% of hay-milk is produced organically. This means that these hay-milk farmers additionally comply with organic regulations. In the case of organic hay-milk, the proportion of concentrated feed may only be 15% of the annual ration, which is much stricter than in the EU organic regulation. (for comparison: in the EU organic regulation, up to 40% is possible). The regulations on free stall and pasture are also stricter for organic hay-milk. Organic hay-milk is the highest quality type of milk on the Austrian market and is also rewarded with the highest producer milk price.

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<sup>8</sup> Hay milk regulation of ARGE Heumilch Österreich, Rules for silage-free milk; 2022: <https://www.heumilch.com/heumilch/regulativ/>

### 1.3. Site-appropriate agriculture

The task of modern hay farming is to combine productivity and profitability with sustainability. Site-appropriate milk production using locally available resources, the preservation of biodiversity and the conservation of soil and water are just as much prerequisites as animal-friendly husbandry with grazing in the summer period and high product quality, to convince society and consumers of the advantages of this form of farming. The focus is on the sustainable farming of permanent grassland.

Permanent grassland is land that is naturally used for forage production through self-propagation for at least 5 years without being converted to cropland. High-quality permanent grassland stocks are rich in species. Sustainable use creates a high humus content in the soil, which in turn binds a great deal of carbon and ensures high soil fertility.

To produce high-quality basic ration for dairy animals from permanent grassland, haymaking techniques with modern drying equipment are essential, in addition to good plant stock and optimal harvest periods. From an ecological and economic point of view, these techniques will become even more important in the future.



*Figure 2  
In mountainous regions, haymaking is still often done by hand, albeit with machine assistance due to the steep slopes.*

## 2. HISTORICAL SIGNIFICANCE

Humans have been practicing agriculture since they became settled about 10,000 years ago. This was the prerequisite for increasing population figures. They domesticated animals and raised livestock for meat and milk production and at the same time, stockpiled to be prepared for climatic and seasonal changes. When humans also settled in the Alpine region, they inevitably had to store food for the winter.

Exactly when the first hay was produced can probably no longer be traced today. In the Alpine region, however, agriculture can be traced back for more than 4,000 years<sup>9</sup>, and findings in the Tyrolean Ötztal verify rudimentary Alpine farming back in around 6300 BC.<sup>10</sup> This must also have been associated with at least rudimentary hay farming, as otherwise the survival of dairy animals would hardly have been possible in the Alpine climate zone with cold, snowy winters.



*Figure 3*  
*Hay carrier, photography, 20s, 20th century;*  
*Source: Genbank, Land Tirol*

Until well into the 20th century, dairy farming in the Alpine regions automatically meant hay farming. However, for a long time it was closely associated with arable farming because specialisation in agriculture only began in modern times.

The rapid agricultural developments of the 20th century made the formerly widespread hay farming industry the regional niche of agricultural production that it is today. The goal of ARGE Heumilch is to preserve this niche of sustainable and generation-oriented farming.

The production of cheese and other dairy products throughout the ages is also closely related to dairy farming. Back in the Old Testament, Jesse has his son David bring ten pieces of cheese to the chief.<sup>11</sup>

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<sup>9</sup> Wopfner, Hermann: Bergbauernhandbuch. Von Arbeit und Leben des Tiroler Bergbauern; Vol. 3: Wirtschaftliches Leben; published by Grass, Nikolaus; Innsbruck 1997; p. 5/ p. 183

<sup>10</sup> Bracharz, Kurt: Von der Alp auf den Teller. Käsekultur in Vorarlberg; Innsbruck 2014; p.42

<sup>11</sup>Book of Samuel, chapter 17, verse 18, quot. after Bracharz K.: Von der Alp auf den Teller. Käsekultur in Vorarlberg; Innsbruck, 2014; p.15

And, according to archaeological sources, the Sumerians (3rd millennium B C) were knowledgeable about cheese production.<sup>12</sup> In that region along the Fertile Crescent, however, this probably was not hay milk cheese. However, cheese was also produced early on in the hay milk regions along the Alps. In his work about Tyrolean mountain farmers back in the 1930s, Wopfner emphasised that "cheese (...) (played) a greater role in the popular diet in olden times than today."<sup>13</sup>

There is evidence from back in Roman times that cheese was exported to Rome from Rhaetia - which stretched from what is now eastern Switzerland through Vorarlberg and Tyrol to South Tyrol.<sup>14</sup> This can also be found in Roman sources as "caseus alpinus" or "caseus raeticus".<sup>15</sup> The Roman Empire had a great need for food and for dairy products and cheese from the Alpine areas.

#### **2.1. Middle Ages to modern times**

Until the Middle Ages, however, agriculture was generally characterised by self-sufficiency. Where possible, everything necessary for life was produced on the farm and what was needed beyond one's own production had to be earned through trade in livestock, cheese or other products. Due to the convenient location on transit routes, supraregional trade was of great importance in the hay milk regions from early on. The better the development of transport routes over the centuries, the more importance was given to dairy farming and the export of milk, butter and especially cheese.<sup>16</sup>

While in Tyrol the farmers were already free in the Middle Ages, elsewhere they had to pay interest to the landowners. Sources such as the Churrätische Reichsurbar of 843 show that cheese was also quite common as interest.<sup>17</sup>

In the "Little Ice Age" from the 16th century, conditions were so cool and damp that arable land was abandoned again in the valley and converted into pasture, and at higher elevations land was increasingly cleared to create mountain pastures.<sup>18</sup>

Even in the city, most households had dairy cattle for self-sufficiency until the Middle Ages. As the population of cities increased in the transition between the Middle Ages and modern times, so did the demand for milk and cheese, which were eventually imported from the surrounding countryside and traded at urban markets.<sup>19</sup> Increasing numbers of people moved to the cities at the beginning of the modern era and took up specialised professions there. They could no longer supply themselves with food, and as fewer agricultural workers now had to supply more people in the city with food, this development eventually led to specialisation in agriculture as well. However, not only the increasing demand from the cities, but also improved conditions for agriculture (draining of swamps, regulation of rivers, clearing) favoured this development.<sup>20</sup> Dairy farming - at that time exclusively hay farming - was born as a separate branch of agriculture.

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<sup>12</sup> Bracharz K, 2014; p.18

<sup>13</sup> Wopfner H. 1997; p. 7

<sup>14</sup> Wopfner H.1997; p. 7

<sup>15</sup> Bracharz K., 2014; p..42f

<sup>16</sup> Wopfner H., 1997; p. 184

<sup>17</sup> Bracharz K., 2014; p. 43

<sup>18</sup> Bracharz K., 2014; p.44

<sup>19</sup> Wopfner H., 1997; p. 190

<sup>20</sup> Wopfner H., 1997; p. 259ff

The next qualitative leap was made at the end of the 18th/beginning of the 19th century, when common pastures were abolished during the Josephine reforms.<sup>21</sup> As a result, those areas that previously had to be kept free as pastures for the animals in the entire village could be converted into meadows and mowed more often. The additional land, but above all the fact that the farmers in question made more of an effort for their own yield, increased the yield. Cattle were increasingly fed in the barn, but also taken to Alpine pastures for grazing.<sup>22</sup> Stable feeding also increased the fertiliser yield, which in turn increased the yield of the meadows.

At the same time, from the 17th/18th century, Vorarlberg landlords and farmers became increasingly interested in the high-quality semi-hard cheeses produced in Switzerland. This led to immigration from the Appenzell region to the Bregenz Forest, which brought knowledge of cheese to the cheese region we know today.<sup>23</sup> Previously, only butter, which had to be sold to the government, and cream and sour cheeses were produced for home consumption. The government was not enthusiastic about the production of semi-hard cheese and issued several bans in 1699, 1700 and 1715. In the end, however, renneting prevailed - also due to some minor uprisings.<sup>24</sup>

In the Bregenzerwald, especially in the 2nd half of the 19th century, so-called "cheese barons" bought up the milk and traded the cheese up to the fringes of the Habsburg monarchy. The winter milk was paid for in advance at a slightly reduced price, which put the farmers in a debt relationship.<sup>25</sup>

Due to industrialisation and rural exodus, agricultural labour became a scarce commodity over the centuries. Cattle and dairy farming therefore became even more attractive because it required less labour than, for example, arable farming. In the Alpine Arc, hay farming has thus made a decisive contribution to the security of supply for the entire population since the early modern period.

Throughout the 19th century, agriculture became increasingly specialised, which gave even more importance to hay farming. In the middle of the 19th century, in the municipality of Natters, south of Innsbruck, for example, the area covered by meadows and pastures already exceeded that of arable farming.<sup>26</sup> In the 19th century, people also began to deliberately sow higher-yielding grasses and fertilise more. The farm's own liquid manure acted as the main fertiliser.<sup>27</sup> This specialisation and agricultural practice created the cultural landscape that we associate today with the Alpine areas in Austria.

Structural change during the Industrial Revolution also led to a move toward hay farming in the Salzburg lakeland region. Until then, in this hilly region north of the city of Salzburg, arable farming (grains) and cattle breeding were practiced in addition to dairy farming. However, the opening up of the Danube Monarchy by rail brought cheaper grain from the eastern crown lands to the monarchy, so that agriculture in the region increasingly focused on the more lucrative dairy farming industry and especially the production of cheese.<sup>28</sup>

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<sup>21</sup> Wopfner H., 1997; p. 282ff

<sup>22</sup> Wopfner H., 1997; p. 27

<sup>23</sup> Bracharz K., 2014; p.44

<sup>24</sup> Bracharz K., 2014; p.50

<sup>25</sup> Bracharz K., 2014; p.57

<sup>26</sup> Wopfner H., 1997; p. 300

<sup>27</sup> Wopfner H., 1997; p. 293ff

<sup>28</sup> Ramminger Leopold: Unser Seekirchen – Aus vergangenen Tagen; Band 8: Die ehemaligen Seekirchner Käsereien, Seekirchen am Wallersee 2019; p. 5

## 2.2. Development in the 20th century

Industrialisation only reached Austrian agriculture at a very late stage. It was not until the 60s to 80s of the 20th century that large-scale farms begin to further specialise and focus their operations.<sup>29</sup> In the Alpine Arc, this development started particularly late for various reasons: Austria did not join the EU and thus the Common Agricultural Policy until 1995, which put further pressure on small farms.

In the hay-milk regions, a hard cheese tradition has developed over the centuries as a characteristic cheese culture. The hard cheeses have a particularly long ripening period (from at least 3 months up to 3 years). Clostridia spores/butyric acid bacteria develop in the silage, enter the cheese dairy via the milk and cause major problems, especially during cheese ripening due to secondary fermentation. The cheeses then taste bitter, puff up and form misshapen holes. For this reason, the processing companies that produced hard cheese demanded hay milk from their milk suppliers, as this is hardly contaminated with Clostridia spores. This led to the creation of silage restricted areas where farmers were not allowed to produce or feed silage. These areas contributed decisively to the preservation of the farming method.

Furthermore, during the structural change until EU accession in 1995 and beyond, Austrian agricultural policy deliberately supported the preservation of small-scale agriculture in mountain areas. On the one hand, this policy was intended to secure the incomes of farming families, and on the other hand, it was also intended to acknowledge their contribution to the preservation of the cultural landscape. Due to this policy, the retreat of hay farming could be stopped.

Hay farming has been and continues to be taken into account in the support measures of ÖPUL (Austrian Policy for Sustainable Agriculture), which is also due to the efforts of ARGE Heumilch as the lobby group of hay-milk farmers.



*Figure 4  
The hard cheese tradition contributed to the preservation of hay milk farming.*

<sup>29</sup> Bätzing W.: Landleben. Geschichte und Zukunft einer gefährdeten Lebensform; Munich, 2020; p. 127

### 3. CONTEMPORARY RELEVANCE

#### 3.1. Relevance in the food trade

Today, more than ever, consumers want products that are produced sustainably. This desire can be fulfilled with hay milk and hay milk products. After all, hay farming protects the environment, preserves biodiversity and helps protect the climate. One of the tasks of ARGE Heumilch is to clearly communicate these advantages to increase awareness of hay milk and boost demand. For this purpose, national promotion programs within the framework of rural development (EAFRD) are being tapped into, as well as promotion programs (AGRIP - Promotion of Agricultural Products) on the part of the European Union. The following objectives are being pursued:

- Improving the competitiveness of primary producers (farmers)
- Primary producers (farmers) receive a higher share of the final price
- Higher added value of the agricultural products of the primary producers

Through traditional communication measures financed by membership fees and subsidies, as well as through cooperation with the food trade in Austria and Germany, it is possible to continue marketing for the entire hay milk industry. Sustainability and animal welfare as well as tradition, regionality and originality are playing an increasingly important role in purchasing. As the traditional and earliest form of milk production, hay milk is therefore fully on trend and can position itself well as a niche product. This differentiation also enables dairies and cheese factories as well as food retailers to achieve higher prices.



In addition to the 100% marketing of TSG hay milk nationally and abroad, the promotion of competition between cheese factories and dairies is an essential factor. Competition for the raw material is created and thus a greater incentive to pay primary producers (farmers) a higher share of the value chain.

The sales measures of ARGE Heumilch Österreich achieve a clear differentiation on the market for TSG hay milk to decouple the sales market for TSG hay milk from the general milk market as far as possible. As a result, dairy farmers receive a higher premium and the most stable milk price possible, even in the event of market slumps. This is the only way to preserve the endangered system.

In 2021, the delivery volume of TSG hay milk in Austria was around 520 million kilograms. This corresponds to about 15% of the total volume of milk delivered. Comparison in Europe: The hay milk share of the total European milk volume is less than three percent. Organic hay milk accounts for a share of about 38% of Austria's TSG hay milk<sup>30</sup>. This is currently the raw material most in demand.



**Hay milk premium:**

**2009: ~ 1 cent**

**2021: 5-7 cents**

<sup>30</sup> Data based on the delivery quantities ARGE Heumilch 2021



A comparison of RollAMA<sup>31</sup> data for the full year in 2009 with data for the full year in 2021 shows that turnover and sales of hay milk products have developed very well since marketing began in 2009. In 2021, about 47,000 tons of dairy products made from TSG hay milk with a turnover of more than 147,000,000 euros were sold in the Austrian retail trade (incl. discounters). The hay milk market share in 2021 was therefore 7.5% of the total sales of all dairy products.

	VOLUME (t)			VALUE (1,000 EUROS)		
	2009	2021	% change	2009	2021	% change
Total dairy products	618,476	642,346	3.9%	1,448,077	1,952,159	34.8%
Hay milk dairy products	18,580	46,979	152.8%	43,684	147,199	237.0%
White pallet	401,550	409,333	1.9%	461,408	636,457	37.9%
White pallet hay milk	15,256	38,239	150.6%	16,024	61,407	283.2%
Yellow pallet	66,167	88,417	33.6%	535,902	786,426	46.7%
Yellow pallet hay milk	3,313	6,816	105.7%	27,608	77,495	180.7%

Figure 5  
Comparison of sales and revenue figures for 2009 and 2021

For years, Germany has been the strongest export market for hay milk products, especially cheese made from TSG hay milk. Meanwhile, more than 60% of Austrian hay milk is delivered abroad<sup>32</sup>.

An online survey conducted between November 11 and 25, 2021 among 1613 Austrians aged 15 to 64, revealed awareness of TSG hay milk at 86.7%. In the core HH ABC1 target group, an awareness level of 92.5% was even recorded<sup>33</sup>.

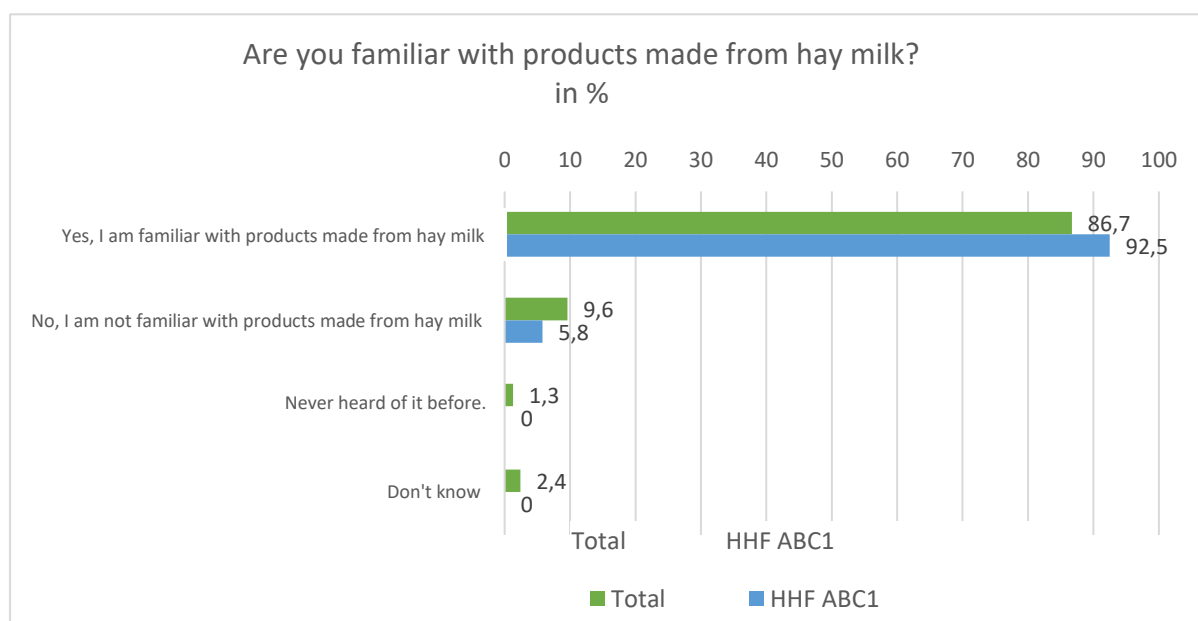


Figure 6  
Awareness of hay milk in Austria

<sup>31</sup> RollAMA is a rolling agricultural market analysis and is prepared on behalf of AMA Marketing GesmbH as a joint project of the market research institutes KeyQUEST Marktforschung GmbH and GfK Austria GmbH.

<sup>32</sup> Estimate based on voluntary information provided by member companies. Exact data is not collected.

<sup>33</sup> Consumer-Connection Study for Heumilch, Carat, Vienna 11/2021

Hay milk is not only well known, but it is also readily purchased. The HHF ABC1 target group in particular with high purchasing power (heads of household with average or above-average income) likes to opt for hay milk products.

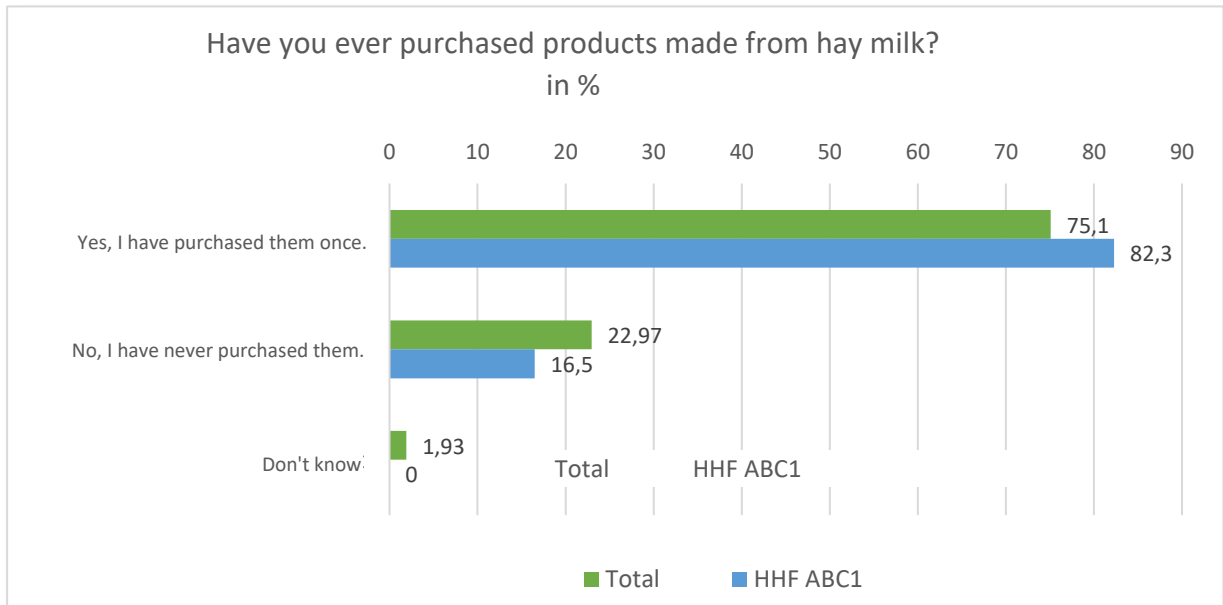


Figure 7  
Buyer reach of hay milk products

Despite this positive development, it must be pointed out that this development could only be achieved due to the implemented activities. Without these efforts, the amount of hay farming would have decreased tremendously.

The current energy crisis due to the Ukraine war clearly shows that sustainable systems like hay farming can always come under pressure. The development is still positive but currently not to the same extent as in previous years. Therefore, hay farming must continue to be supported in the future to cushion the extent of fluctuations in the volatile dairy market for hay milk farmers.

### 3.2. Contribution to the UN Sustainable Development Goals (SDG's)

With its gentle, site-appropriate farming method and small-scale agriculture with family-run farms, hay farming contributes to the "Farm to Fork" strategy as well as to the "EU Biodiversity Strategy".

The Center for Global Change and Sustainability at the University of Natural Resources and Life Sciences, Vienna, conducted a study on behalf of ARGE Heumilch Österreich in 2019 that assesses the hay milk production system in the context of the United Nations Sustainable Development Goals (SDGs).<sup>34</sup> The report looks at the sustainability of hay farming holistically according to environmental, social and economic issues. The arguments given in the following text are taken from this report.

#### Mosaic grassland use promotes/protects biodiversity

Sustainable farming of permanent grassland is the central core of hay farming. Mowing is done spaced out at different times, which preserves refuge areas for zoological species and promotes their existence. In a report by the International Lake Constance Foundation in Radolfzell<sup>35</sup> on biodiversity criteria in standards and quality seals of the food industry, it is stated that hay farming with site-appropriate and less intensive grassland use contributes to the preservation of biological species diversity. A study by the Institute Suske Consulting Vienna<sup>36</sup>, in which hay farming was analysed in relation to the preservation of biodiversity, also confirms the positive effects. Biodiversity in hay milk meadows is greater because the first mowing is later and there is a stronger mowing mosaic with important refuge areas for insects. The usage intensity is also lower and the average plant height is more varied.



<sup>34</sup> Zollitsch et. al., 2019

<sup>35</sup> Internationale Bodensee-Stiftung Radolfzell: Baselinereport, Biodiversitätskriterien in Standards und Qualitätssiegeln der Lebensmittelbranche; 2013.

<sup>36</sup> Suske W., Depisch B., Huber J., Frieß T., Holzinger W., Derbuch G., Kahapka J., Huber E., Gunczy W.L.: Analyse der Zielerfüllung der ÖPUL-Maßnahme „Silageverzicht“ in Bezug auf Biodiversität; Vienna, 2020



Figure 8  
Mosaic farming: All areas are never mowed at the same time.

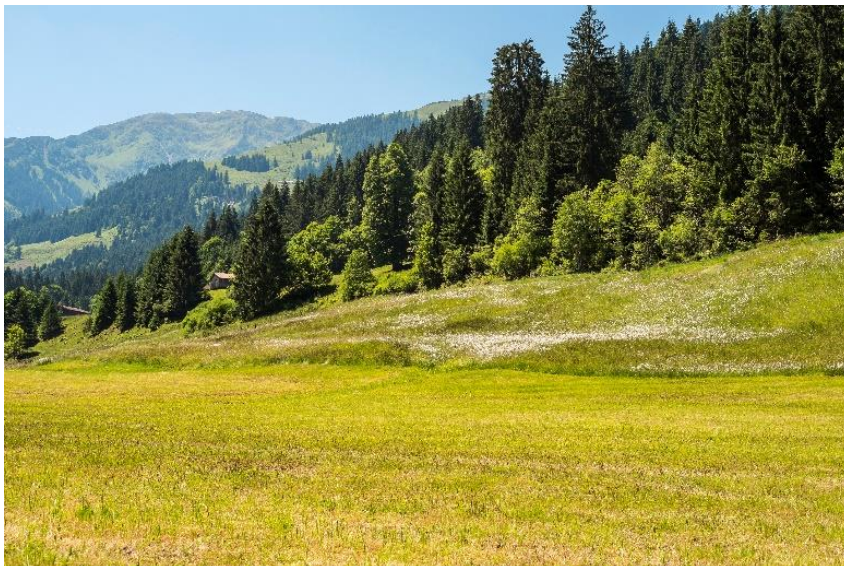


Figure 9  
Mosaic farming: All areas are never mowed at the same time.

### Limited amount of concentrated feed conserves resources

Another sustainable aspect of hay farming is the limited amount of concentrated feed. Roughage in the form of grass and hay constitutes the bulk of the feed. The proportion of the dry feed annual ration is at least 75%. Just like organic milk, the use of concentrated feed is limited in hay milk, must originate from Europe and must not be genetically modified according to current legislation. According to the EU Organic Regulation (VO-EU 2018/48), max. 40% concentrate feed is allowed for organic milk, only 25% for hay milk and just 15% for organic hay milk. In a study conducted by BOKU Vienna<sup>37</sup>, which analysed the eco balance of model dairy farms, hay farming performed significantly better than industrialised agriculture. The study confirms that sustainable farming of permanent grassland preserves special habitats and conserves valuable resources such as grain and water. The water footprint is three times less with hay farming than with intensive agriculture. The EU Biodiversity Strategy points out that the targets set *must not lead to deforestation in other regions of the world. Primary and virgin forests are meant here.* With limited grain purchases exclusively from Europe, hay farming also meets this goal. This also means that farm animals do not become direct food competitors for humans in poorer regions (plate-trough debate), considering that one third of the world's arable

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<sup>37</sup> Hörtenhuber S., Zollitsch W.: Ökobilanz von Milchvieh-Modellbetrieben; Vienna, 2013

land is now used to produce animal feed. Moreover, permanent grasslands do not exhibit any competition for human nutrition even in mountainous regions, since they are unproductive as arable land. Rather, farming takes precautions against scrub encroachment and forestation and keeps the Alpine areas open.

### Low water footprint

In addition, the water footprint of milk depends very much on the system in which the milk is produced. If dairy cows are fed large quantities of purchased feed such as soy and maize from overseas, the water footprint increases significantly due to the long transport distances.

Milk production based on locally produced grassland fodder such as hay farming reduces the water footprint of milk and therefore helps to conserve resources.



Figure 10  
Species-appropriate feeding with only a small proportion of concentrated feed, which must be GMO-free and originate from Europe.

### Permanent grassland as a CO<sub>2</sub>sink

The EU Biodiversity Strategy under point 2.2.3. states that poor soil management such as deforestation, overgrazing, unsustainable agricultural and forestry practices, construction activities and soil sealing contribute to soil degradation. Hay farming also counteracts this. Sustainable use of grassland with pasture farming is crucial for climate change as it prevents soil degradation and leads to high humus content and healthy soils. This stores enormous amounts of carbon that would otherwise escape into the earth's atmosphere and would be relevant to the climate as CO<sub>2</sub>.

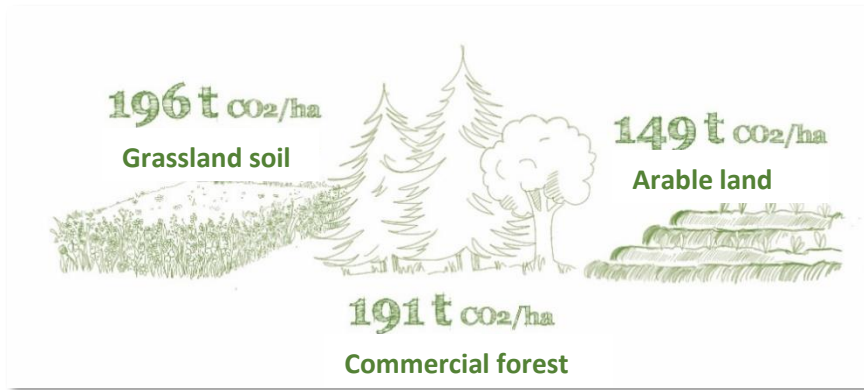


Figure 11  
Grassland soils store approx. 196 t CO<sub>2</sub>/ha

According to a study by the Center for Global Change and Sustainability at BOKU Vienna<sup>38</sup>, permanent grassland stores significantly more carbon C (70 t/ha) in absolute amounts in the upper 30 cm than arable soils (50 t/ha). In transitional cropland, ruminants protect grassland from conversion to cropland or protect some stored carbon from loss. In deeper soil layers, carbon storage in permanent grassland (196 t/ha) is even one third higher than in arable land (149 t/ha) and also higher than in commercial forest (191 t/ha). Moreover, humus-rich soils store more water and can thus survive longer periods of drought.

Tangential SDG

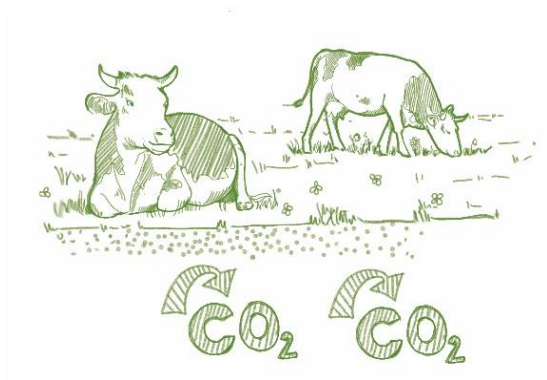


Figure 12  
Permanent grassland stores more carbon than arable land and commercial forest.

### High animal welfare standards

Aspects of animal welfare are not explicitly addressed in the very anthropocentric approach of the SDGs. In a production system where animals play a central role, their welfare must be given high priority. Ultimately, a high standard of animal welfare can also ensure the sustainability of food production systems and the resilience of agricultural practices. Hay farming makes an important

<sup>38</sup> Zollitsch et.al., 2019

contribution to animal welfare. Ruminant-friendly feeding and species-appropriate husbandry contribute significantly to the health and vitality of the animals.

In the case of hay farming, combined husbandry is obligatory and permanent tethering is prohibited. Open stalls, outdoor exercise or pasture/Alpine grazing are required for at least 120 days. Since cows spend half of the day resting and lying down, overcrowding in the stalls is prohibited. A lying area (1:1) must be available for each dam. Bedding with common agents such as straw is to be used for the lying areas and/or soft bedding is to be provided for the animals. From an animal health point of view, the solids of the manure separation are not allowed as bedding. Dehorning may only be performed only with effective anesthesia administered by a veterinarian. In calves, docking the tail is prohibited. Growth- and performance-promoting substances must not be used. Professional care by a veterinarian (Animal Health Service membership) is mandatory for farms.<sup>39</sup>

All hay-milk farmers are looked after by contracted veterinarians of the animal health service. With professional advice from veterinarians, the well-being of the hay-milk cows is checked preventively during regular inspections and advice is given on the subject of keeping them healthy. Homeopathy is also being used on more and more farms.



*Figure 13  
Hay farming also contributes to  
excellent animal welfare.*

High herd efficiency is not measured in terms of hay milk due to the limited amount of concentrated feed. In Germany, the average lactation performance of a cow was about 8000 kg on average for all breeds. A herd efficiency of 10000 kg or more is not uncommon here.<sup>40</sup> In intensive milk production with a high milk yield, the rations for dairy cows contain proportions of up to 50% concentrate. In addition, as concentrate intake increases, the intake of basic ration decreases. The reasons for this decrease are the increased acid production from the fermentation of the non-fibre carbohydrates of the concentrate, which damages the very rumen microbes that specialise in the breakdown of the skeletal substances, thus preventing both digestibility and feed intake of the basic ration.<sup>41</sup>

The milk yield of cows has increased steadily in recent decades due to selection for milk quantity, appropriate feeding, veterinary care and successful management, and it is likely that this trend will

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<sup>39</sup> Hay-milk regulations of ARGE Heumilch Österreich, January 2022

<sup>40</sup> Martens, Holger (Institut für Veterinär-Physiologie der Freien Universität Berlin): Leistung und Gesundheit von Milchkühen: Bedeutung von Genetik (Ursache) und Management (Wirkung); in Tierärztliche Praxis Großtiere; 4/2016

<sup>41</sup> Gruber, Leonhard (In: Institut für Nutztierforschung, HBLFA Raumberg-Gumpenstein. 24. Viehwirtschaftliche Fachtagung): Einfluss der Kraffuttermenge auf Futteraufnahme und Leistung von Milchkühen; 2007

continue. However, as milk yield has increased, disease rates have increased and useful life has decreased. Extensive animal breeding studies revealed genetic correlations between milk yield and diseases such as ketosis/fatty liver degeneration, mastitis, hoof diseases, metritis (all inflammatory forms) and decrease in fertility, the pathogenesis of which is essentially causally determined by the negative energy balance as a consequence of selection for high milk yield.<sup>42</sup> Out of all the forms of utilization, green fodder has the best feed value followed by modern produced hay. Green fodder and all types of hay are superior to silage because they retain a number of beneficial plant constituents. All of them lack the undesirable fermentation products of silage. From an animal health standpoint, hay is an alternative to one-way silage feeding, especially with high-risk grass and legume silages.<sup>43</sup> In addition to feeding according to needs, the health status must also be taken into account: dairy cows would generally be fed rapidly digestible and poorly structured substrates, which would not suit the physiological digestive processes of ruminants.<sup>44</sup>



Figure 14  
Small herds ensure high animal welfare.

Since hay milk farms are not in the high performance range, it can be assumed that this is generally a good starting point for health status and fertility parameters.<sup>45</sup> The relationship between milk yield, negative energy balance, decreased immunosuppression, and increased susceptibility to infection and disease are well established in the literature.<sup>46</sup>

Tangential SDGs



<sup>42</sup> Martens, H; 4/2016

<sup>43</sup> Hoffmann, Manfred (Sächsischer Landeskontrollverband): in agrarheute RIND; Mai 2022

<sup>44</sup> Zebeli, Quendrim; Khol-Parisini, Annabella: Strukturversorgung und Leistung der Milchkuh: zwei Seiten einer Medaille. In: Reiko Rackwitz (Pub.): LBH: 7. Leipziger Tierärztekongress – Tagungsband 1; 2014

<sup>45</sup> Zollitsch Werner et al., 2019

<sup>46</sup> Brade, Wilfried; Brade, Erwin (In: Berichte über Landwirtschaft. Zeitschrift für Agrarpolitik und Landwirtschaft 93 (2)): Vor- und Nachteile einer sehr intensiven Milcherzeugung aus der Blickrichtung des Kraftfuttereinsatzes und der Tiergesundheit; 2015



**Strengthening rural areas**

Hay farming enables farmers to achieve higher yields, thereby helping to strengthen rural areas in the grassland-mountain region. Subsequent generations are more likely to remain in agriculture if they see the process from an economic and social perspective. The processing plants also tie jobs to rural regions.

In addition, many hay milk farms are operated on a part-time basis, with farmers often acting as farm managers. Through sustainable agriculture, they also have the positive perspective of being able to combine work and family life well.

The share of female farmers with an off-farm occupation increased significantly in Austria from 2006 to 2016 from 22% to 37%. There is no separate data on hay-milk farms.



Figure 15  
Extent of off-the-job employment (2006/2016)<sup>47</sup>

The off-farm occupations are widely spread: 22% work in offices/banking, 14% in education/training, 12% in sales, 11% in gastronomy or tourism, 10% in the health sector.

16% of the women farmers who work outside the farm do so for more than 20 hours per week. This share has doubled from 2006 to 2016. There is no data on the share of off-farm income in farm income.

A per capita income of hay-milk farms is not available, as the income of hay-milk farms is not surveyed separately. However, the Green Report of the Federal Ministry of Agriculture, Forestry, Environment and Water Management provides information on the income of mountain farms. Since 88% of the hay-milk farms are located in the mountain area, the comparison of mountain farms and non-mountain farms allows conclusions to be drawn about hay farming, since the hay-milk farms can be equated with the mountain farms.

<sup>47</sup> keyQuest Survey: Situation of women farmers in Austria 2016, p. 67

## Ausgewählte Ergebnisse der Bergbauernbetriebe<sup>1</sup> nach Gruppen 2021

	RLF in ha je Betrieb	nAK je Betrieb	Einkünfte aus Land- und Forstwirtschaft	
			je Betrieb in Euro	Veränderung zu 2020 in %
Durchschnitt aller Betriebe	28,0	1,33	32.146	+15,1
Nichtbergbauern	35,4	1,28	41.727	+17,1
Bergbauern	21,6	1,37	23.884	+14,1
Erschwernispunktegruppe 1	25,6	1,38	28.460	+23,9
Erschwernispunktegruppe 2	21,8	1,39	24.467	+12,2
Erschwernispunktegruppe 3	18,4	1,34	20.755	+13,9
Erschwernispunktegruppe 4	14,8	1,32	13.574	-18,9
Betriebe in nicht benachteiligten Gebieten	38,5	1,26	46.282	+24,4
Betriebe in benachteiligten Gebieten	24,3	1,35	27.153	+9,5

1) umfassen die Betriebe im Berggebiet mit Erschwernisgruppen

Quelle: BML, LBG Österreich, BAB

Figure 16

Income of agricultural holdings by mountain farmers (severity point groups) and non-mountain farmers; from: Green Report 2022



**Protection against erosion, scrub encroachment and forestation**

Permanent ground cover with grasses provides natural erosion control and, unlike cropland, also offers less potential for soil degradation<sup>48</sup>. Therefore, milk production based on meadow forage, such as hay farming, is the more sustainable farming method compared to "intensive milk production" with a high amount of concentrated feed.

In addition, the hay milk farmers' maintenance measures protect against scrub encroachment and forestation, thereby preserving the Alpine cultural landscape as well as tourist and local recreation areas. Especially in the mountainous regions and their foothills, many areas are not suitable for modern agriculture due to the wet climate. Here, hay farming represents regional food production that conserves resources.



**Positive food conversion efficiency (plate-trough debate).**

In industrialised agriculture in Europe, farm animals are increasingly becoming direct food competitors for humans, as more than a third of the world's arable land is already used for the production of animal feed such as soy or corn. However, grains are also popular in the human diet. Therefore, in the context of resource-saving milk production, primarily regional feeds should be used that do not compete with human nutrition. Through limited grain rationing, as well as through the farming of permanent grassland, hay milk farmers therefore make a sustainable contribution to the plate-trough debate.

In industrialised agriculture, one cow eats the amount of grain that can feed three people. Hay farming, on the other hand, relies on species-appropriate feeding.



**3.3. Conventional and organic haymaking**

Hay farming is in itself already a very sustainable form of milk production. In Austria, conventional hay farming means that producers and processors adhere to the hay-milk regulations of ARGE Heumilch (see annex to the proposal). This includes, among other things, limiting the use of concentrated feed to a maximum of 25% of the annual ration and specifies what the concentrated feed may consist of.

<sup>48</sup> Soil degradation is the deterioration of the ecosystem services of the soil. This leads to significantly reduced soil fertility.

Fertiliser regulations are also part of the hay-milk regulation, as are animal welfare measures. The hay-milk regulations are regularly adapted to the requirements of the market.

Furthermore, 38% of hay-milk is produced organically. This means that these hay-milk farmers additionally comply with organic regulations. In the case of organic hay-milk, the proportion of concentrated feed may only be 15% of the annual ration, which is much stricter than in the EU organic regulation. (for comparison: in the EU organic regulation, up to 40% is possible). The regulations on free stall and pasture are also stricter for organic hay-milk. Organic hay-milk is the highest quality type of milk on the Austrian market and is also rewarded with the highest producer milk price.



*Figure 17  
Whether organic or  
conventional: a high proportion  
of basic fodder characterises  
hay farming*

## 4. COMPARATIVE ANALYSES

### 4.1. Differences to other dairy farming systems with hay as basic fodder

Hay farming also exists in other regions where winters are cold and snowy. Throughout Europe, about 3% of milk is still produced as hay milk, especially in the alpine regions of Italy, France, Slovenia and Switzerland. The EU quality label "TSG - Traditional Speciality Guaranteed" (see IV.4.4.) has made it possible to achieve a minimum standard throughout Europe.

#### Hay-milk regulative and "TSG - Traditional Speciality Guaranteed"

In order to have a certain product protection throughout Europe, ARGE Heumilch applied for the EU protection "TSG - traditional speciality guaranteed" and received it in 2016 (2019 for sheep's and goat's hay milk). This seal of quality is a minimum standard that applies uniformly throughout Europe.

However, the hay-milk regulation (see Annex 1), according to which the hay-milk farmers in the Austrian Alpine arc farm, goes further than this minimum standard. It is the only region in which hay farming is practised both on a whole-farm and year-round basis.

- Whole-farm means that there must be no silage on the entire hay-milk farm. While in some other systems only the dairy cattle are fed silage-free, in the proposed region also no young cattle may be fed silage and silage may not be prepared or stored on individual areas - for example for sale.

The reason for this lies in the clostridia spores, which are ubiquitous and are increasingly found in silage. If these get into the milk - e.g. via the air - long-maturing cheeses can no longer be produced without chemical or mechanical treatment. In the Austrian cheese tradition, it was therefore important to do without silage throughout the year.

- Year-round means that the renunciation of silage is valid in summer as well as in winter. At no time may silage be produced, fed or even stored.

In addition to the whole-farm and year-round silage renunciation, the hay-milk regulation also prescribes animal welfare standards, which are completely missing in the EU standard.

#### Pasture and/or outdoor exercise

Pasture and outdoor exercise are also not regulated in other hay systems. According to the hay-milk regulation, permanent tethering is prohibited and at least 120 days of pasture and/or outdoor exercise per year are required.

#### 4.2. Comparison with silo farming

With a 15% share of the Austrian dairy market, hay farming is a niche with some regional importance. Internationally, this niche is very small with a market share of less than 3% in Europe. It is therefore worthwhile to compare the system of hay farming with the system of silo farming for a better understanding.

Firstly, it is worth remembering that the region was originally dominated by hay farming. It was only through the industrialisation of agriculture that silo farming became established, where large and flat areas allow for an industrial form of agriculture.

While green fodder is preserved by drying in hay farming, silage is preserved by fermentation. In this process, a silo is filled with grass and sealed airtight. Due to the lack of oxygen, lactic acid bacteria multiply at the right temperatures and ferment the sugar content in the plant mass into lactic acid. This is responsible for the typical sour smell and pH value of less than 4. If there is too much oxygen or the temperature is too high, fermentation pests such as yeasts, moulds, putrefactive bacteria, butyric or acetic acid bacteria displace the lactic acid bacteria and prevent the fermentation process.

If the process is flawless, the mixture eventually becomes too acidic even for the lactic acid bacteria and fermentation comes to a halt. The silage is now ready and the feed can be kept for a long time. However, care must be taken to ensure that as little air as possible enters the system when the silage is removed, as too much oxygen will spoil the silage.

While there are strict feeding regulations in hay farming with the hay-milk regulation, almost everything is allowed in industrialised agriculture. It relies mainly on maize in basic fodder production, which requires the use of high amounts of fertilisers and the use of synthetic pesticides. Neither of these is provided for in hay farming.

In silage farming - as in hay farming - grassland fodder is also used. However, this is usually produced from arable green fodder. In its cultivation, seed mixtures for field fodder are used, which have only a limited species diversity and a high fertiliser requirement. These grassland forage crops are necessary to achieve an appropriate silage quality.

In hay farming, on the other hand, the plant stand on permanent grassland is merely mown - and only when a large number of the plants are in full bloom and have been able to reproduce themselves. Re-seeding is therefore only necessary in rare cases. For this purpose, seed mixtures with a high species diversity are used to maintain the quality of the grassland forage. Fertilisers are used only to a very limited extent and mainly the manure from dairy farming.

In silage farming, field fodder is also produced from arable land, which is repeatedly turned over. This ploughing releases the carbon bound in the soil, which combines with oxygen in the air to form CO<sub>2</sub> and becomes climate-relevant. In hay farming, on the other hand, the carbon remains bound in the soil because the permanent grassland is not turned over.

Both systems - hay farming and conventional dairy farming (silage farming) - therefore use permanent grassland. However, while in hay farming it is the basis for fodder throughout the year, in silage farming it is only part of the fodder ration. In silage farming, mixed rations are usually fed, in which grass silage, maize silage and concentrated and protein feeds are mixed.

In hay farming, the cows are essentially fed what the permanent grassland has in store for them - in summer in the form of pasture, mountain pasture and fresh grass feeding and in winter in the form of hay. The roughage content must be at least 75% for hay-milk, and as high as 85% for organic hay-milk.

#### **4.2.1. History of silo farming**

Silage production has a history similar to that of hay farming. This is already indicated in the word "silo", which is derived from the Greek word "siros", meaning an underground, airtight feed store. These storage containers were known as a granary back in around 7000 B.C. However, it is not known from when the silos were used for fermenting feed.

In the 19th century, there were repeated attempts to develop new methods of ensiling, but they were not very successful. It was not until 1877 that the first manual on silage appeared in France. The production method finally caught on in England, Ireland and Scandinavia from the 1920s onwards.

In Central Europe, silo farming began its triumphant advance during the Second World War and in particular from the "economic miracle" of the 1950s and 1960s onwards. First of all, the decisive advantage of silo farming is that the forage harvest is less dependent on the weather. The grass is only dried before being ensiled in a variety of ways. This increases the effectiveness of the operations and large areas can be mowed at the same time. The grass is also mown earlier, which increases the number of cuts per year.

In the long term, however, both high impact and large area mowing and early cutting reduce species diversity in meadows. Silo meadows must therefore be fertilised and reseeded more intensively than hay milk meadows.

#### **4.2.2. From upright silo to silo bales**

Similar to hay farming, there are different systems for ensiling grass in silo farming, where the basic principle remains the same, but the method of storage and sealing differs.

Until well into the 1980s, upright silos were mainly used in Austria to ensile the grass. The grass, which is still damp, is placed in the upright silo and must be compacted inside to remove as much air as possible. The upright silos are usually made of concrete, wood or plastic. Upright silos have the advantage of requiring little floor space and are therefore especially popular in mountainous regions.

Filling and removal of an upright silo is relatively complex and due to falling and fermentation gases, the risk of accidents is also high. In addition, upright silos are very dominant in the landscape due to their height, which is disadvantageous in tourist areas.

Farms with higher livestock numbers and larger areas often have a bunker silo or flat silo. Here, the cut material is placed on a laterally limited base plate and covered airtight with a film. Compaction is done with a roller tractor.



Figure 18  
Upright silo, image: [landwirt.com](http://landwirt.com)



Figure 19  
Bunker silo, image: [www.fahrsilo.at](http://www.fahrsilo.at)

In the region today, the most widespread method is ensiling by means of round bales. In this process, the dried grass is pressed into bales while still on the meadow and the bales are then pressed into films. The bales can be easily stored and transported. For smaller farms, it pays to organise the machines for pressing and wrapping the bales on an inter-farm basis. The silo bales can generally be stored anywhere, which simplifies the operation, but often disturbs the landscape.

With all variants, the airtight sealing of the fermentation material is absolutely essential. If the film on the bunker silo or round bale is damaged or not properly secured, the silage will spoil and can no longer be used.





Figure 20  
Silo bales, image:  
[www.bluehendesoesterreich.at](http://www.bluehendesoesterreich.at)

As with hay, there are also different quality levels for silage. Quality silage can only be produced with professional knowledge, personal commitment and appropriate care.

#### **4.2.3. Silo milk and cheese production**

In the hay milk regions, there are still many small alpine dairies and cheese factories that practice traditional cheesemaking. The master cheesemakers pay particular attention to gentle processing of the milk. For example, many farms still process raw milk into cheese, or the milk is only thermised, i.e. heated very gently. This preserves the milk flavor better and the cheeses taste more pronounced and complex. Traditional calf rennet, which has better protein coagulation, is still used to thicken the milk. For cheeses such as traditional mountain cheese or Emmental in natural rind, this is a prerequisite for maintaining the cheese for a long period until its peak of maturity. Long-matured cheese specialties made from hay milk represent a distinctive cheese culture in the Austrian Alpine region.

In addition, master cheesemakers depend on excellent quality raw milk. Clostridia spores in particular are feared in cheese production because they not only puncture the cheese with unsightly holes, but also provide a bitter taste. Silage is particularly susceptible to Clostridia spores<sup>49</sup>, which, under the right conditions, spread throughout the farm and especially in the barn. These anaerobic bacteria are very resistant and survive both the digestive tract of the dairy animals and conventional heating processes of the milk.

##### **Advantages of cheese production**

In the production of hard and semi-hard cheeses from standard milk, these Clostridia spores must therefore be removed by centrifugal sterilisation or bactofuge, or their formation must be prevented by the addition of preservatives such as lysozyme. Cheesemakers therefore rely mainly on hay milk instead of silo milk, especially for long-ripening cheeses.

For the production of hard and semi-hard cheese, hay farming offers significant advantages over silo farming: Clostridia spores are not killed even by pasteurisation. They cause butyric acid fermentation

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<sup>49</sup> Ginzinger W., Eliskases-Lechner F., Osl F.: Einfluss der Silage auf die Milch, in: Fachgruppe Lebensmittel, ALVA\_Jahrestagung 2001

in semi-hard and hard cheeses, or so-called "late blowing" (see pictures below). The cheeses contain racks as well as misshapen holes and taste bitter.



Figure 21  
Clostridia spores cause cracks and misshapen holes.

The quality and purity of the milk is particularly important for longer-matured cheeses, which is why silo milk is much less suitable here than hay milk.

Silage milk has fewer good characteristics than hay milk not only for cheese ripening but also for the taste of the cheese. Due to the special feeding method and the biodiversity of hay milk meadows, hay milk has a particularly complex taste, which also has a positive effect on the end product: cheese.

### Fatty acid spectrum of milk

In terms of the fatty acid spectrum of milk, the balance is also more positive for hay milk than for silo milk. According to a study by the University of Natural Resources and Life Sciences<sup>50</sup>, hay milk products have on average about twice the amount of omega-3 fatty acids and conjugated linoleic acids (CLA) than conventional dairy products. As unsaturated fatty acids, omega-3 fatty acids are vital for the human organism and fulfill important tasks, such as for the metabolism and immune system.

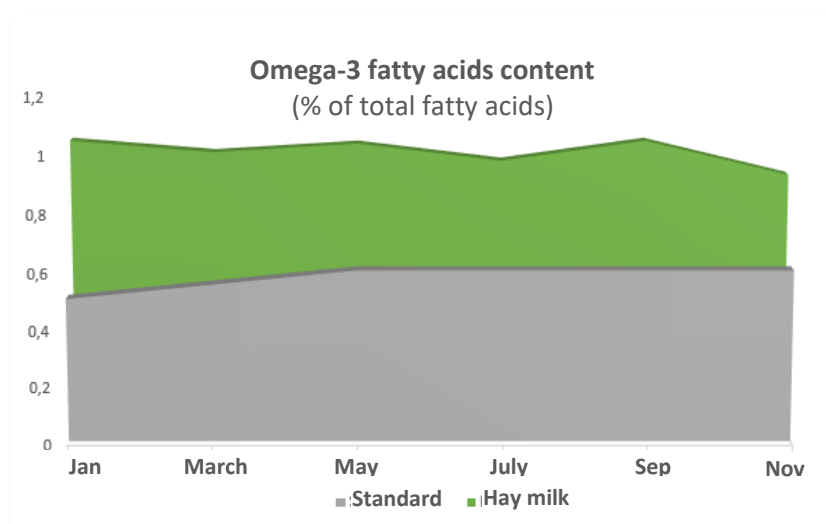


Figure 22  
Fatty acid spectrum of hay milk and hay milk products with a focus on CLA and omega-3 fatty acids.

<sup>50</sup> Seiz, Michaela; Fettsäureverteilung in österreichischer Heumilch – Einfluss der silagefreien Fütterung im Jahresverlauf; Vienna, 2012; p. 65

#### 4.2.4. Silo farming and sustainability

##### **Biodiversity**

For the grass to be ensiled to a high quality, it must not exceed a certain maturity. Specifically, this means that grasses should be mowed before panicle shoots, i.e. at the pre-flowering stage to achieve optimum silage. For clovers, this is the bud stage to no later than the beginning of flowering, and for green grains, no later than the beginning of panicle shoots. If the grass is cut too late, the crude fiber content is too high and the risk of faulty fermentation increases. Early pruning, however, has a negative effect on reproduction and biodiversity.

Farms are larger on average than in hay farming and larger areas are mowed at one time. The work is completed with a high proportion of machines, which are sometimes rented. This adds to the pressure to process large areas in the shortest possible time. For insects and small game, this means that they lose their livelihood over a large area within a few hours and have hardly any means of escape.

A study conducted by Suske Consulting 2020 shows that both the later timing of the first mowing and the subsequent spaced-out mowing in hay farming have a positive effect on the preservation of biodiversity in plants and insects.<sup>51</sup>

##### **Cultural landscapes**

Small, lower-yielding areas are counterproductive in silo farming and are no longer farmed. As a result, the cultural landscape in the Alpine region would be lost because within a few decades less productive meadows and pastures would become overgrown with shrubbery and forest, while elsewhere large areas would change the landscape.

However, this also means that, especially in the mountainous regions, silo farming has less opportunity than in the lowlands. This is because there are hardly any large areas that can be farmed once in this region.

##### **Economic yield**

A farming method must be profitable for the farmers, otherwise it is doomed to failure. In the 1970s and 1980s, silo farming was considered progressive and a large proportion of farmers in Austria converted their production. After all, if they had suitable land for it, they could earn more using silo farming with less personal labour input.

In the last two decades, hay farming has been able to catch up economically. Modern drying systems reduce the amount of work somewhat, and compensation payments and a hay milk premium made possible through marketing as a special milk variety have improved the economic situation of hay milk farms. However, since they are more small-scale than the average dairy farms in Austria, there is still a competitive disadvantage compared to the large and powerful silo farms.

##### **Plate-trough debate**

The plate-trough debate is about competition between human nutrition and animal feed. In silo farming, the question of whether land used for feed production is in competition with human nutrition cannot be answered easily.

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<sup>51</sup> Suske W. et al., 2020, p. 112ff.

Permanent grassland seemingly does not play a role in the plate-trough debate: grass is not suitable for human nutrition and therefore is not a competitor. However, because silo farming is primarily done on large, flat areas, these areas would often be suitable for cropland and thus for human nutrition.

In addition to grass, corn and grains are also grown for silage production. In this case, there is a direct competitive relationship with human nutrition.

**Foils**

Ensiling using foil bales produces large quantities of plastic foil (mostly polyethylene). These foils cannot be reused, so they are recycled in the best case and simply disposed of in the worst case. Back in 2006, more than 5,000 tons of silage foil were sold in Austria.<sup>52</sup> The quantity may have increased many times over by now, but unfortunately current figures are not known.

**Eutrophication potential**

Pronounced grazing periods combined with feeding hay is more beneficial than silage feeding in terms of low eutrophication potential.<sup>53</sup> This means that hay farming reduces phosphorus and nitrogen losses in the soil. Nitrogen leaching and surface runoff in the form of nitrate are only 2.7% for permanent grassland and are much more favourable than for cropland, where they are 10 times higher at 27.7%.<sup>54</sup>

The fact that hay milk cows are fed significantly less concentrate (grain) also has a positive effect on eutrophication potential.

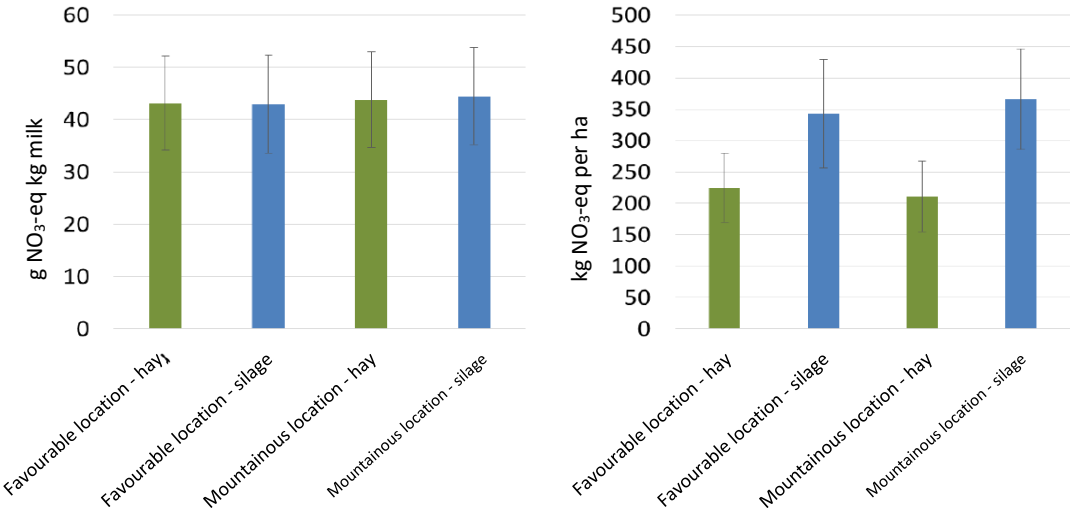


Figure 23 Eutrophication potentials of hay milk farms and conventional farms ("silage" farms) per kg of product and per hectare (acc. to Zollitsch, 2019).

Looking at the eutrophication potential per kg of milk, no difference can be seen between hay farming and industrialised agriculture, which is mainly due to the much higher milk yield per cow on silo farms.

<sup>52</sup> <https://www.bluehendesoesterreich.at/bauernlexikon/siloballen-silageballen-rundballen>  
<sup>53</sup> Zollitsch W., 2019, p. 31ff  
<sup>54</sup> Zollitsch W., 2019, p. 32

However, when eutrophication is considered according to area, the eutrophication potential per hectare of cropland is much lower for hay farming.

Renowned Alpine researcher Werner Bätzing states in his book "Das Landleben": *"Whereas all farming communities anticipate the future at present and organise all their economic activities and actions so that they can be carried out over the long term, industrial society merely operates in the short term and in an individualistic manner, postponing the solution to all the problems that arise from it until the future."*<sup>55</sup>

Hay farming reflects precisely these traditional farming communities, which operate sustainably and on a generational basis, while industrialised agriculture is more like industrial society, the consequences of which will be borne in the future.

**Haymaking and silage farming in comparison**

<b>Hay farming</b>	<b>Silo farming</b>
Permanent grassland as fodder basis, 85% for organic hay-milk and 75% for hay-milk	Besides permanent grassland, mainly arable green fodder and maize are used as fodder basis
The feeding of silage is prohibited - on the whole farm (not even for young cattle) and all year round.	Silage from grass and maize as well as arable green fodder is the feed basis.
Permanent grassland is not turned over. This means that the stored carbon remains bound in the soil.	Production of arable green fodder. The soil is turned over and releases carbon, which becomes CO2 and thus climate-relevant.
Strict feeding rules in the hay-milk regulation	Hardly any feeding regulations
Limited use of concentrated feed, 15% for organic hay milk and 25% for hay milk	No limitation of concentrated feed
Strict fertiliser regulations, essentially farm manure is used.	High amounts of fertiliser required, especially in maize cultivation.
Mosaic management, spatially and temporally staggered.	Large areas are cultivated and harvested at once.
Insects and small game always have refuges.	Insects and small game have no refuges during mowing.
Mowing only takes place when many grasses and herbs are in full bloom and have been able to reproduce themselves.	Mowing takes place 1-2 times more often than with hay farming. The plants cannot reproduce themselves and must be resown.
Hardly any reseeding necessary. If it is necessary, adapt it to the site with species-rich seed mixtures.	Sowing field forage mixtures with low biodiversity

<sup>55</sup> Bätzing W., 2020, p. 122

Low-yielding areas continue to be cultivated and provide special composition of nutrients.	Low-yield land is abandoned or converted.
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### 4.3. Comparison with Mountains of León

The GIAHS Mountains of León region is about a way of life that has been preserved in the region. This does not only concern a production method (e.g. in dairy farming), but the whole way of doing business in the region. Even though hay-milk farmers also usually have several farm bases, they are specialized in milk production. The farmers in the Mountains of León, on the other hand, practice a kind of subsistence farming, in that each family produces a wide range of products. The Mountains of León region has its own social and political structures, ranging from the joint management of public goods to the parliamentary assembly of the families of the region.

In the case of hay farming, on the other hand, although the ARGE Heumilch is a structural framework for hay-milk farmers that monitors compliance with the guidelines, sets the direction for further development, and acts as an advocacy group vis-à-vis politicians. Beyond that, however, the hay farming community has no social or political structures of its own.

#### Hay milk farming in the Austrian Alpine arc

Densely populated (in the inhabited valleys)

Mountainous area and foothills of the Alps

Small-structured, family-run farms

Mosaic-like cultivation of permanent grassland

Dairy farming as the main economic pillar; forestry, tourism, etc. serve as supplements

Mixture of livestock housing, free range and pasture (not shepherded), as well as alpine pasture farming

No joint management of public goods

ARGE Heumilch as representation of interests and control body, organized as an association (voluntary membership)

#### Mountains of León

Sparsely populated

Mountainous area and high plateau

Small-structured, family-run farms

Mosaic-like cultivation of all farmland

Subsistence way of life, farms produce much themselves

Sheperded (forest) pasture

Joint management of public goods

Own political system with parliamentary assembly (Concejos) of the families

#### 4.4. Comparison with GIAHS Barroso

The GIAHS Barroso seems to be very similar to the one in the mountains of León. This is also a subsistence economic system in a closed mountain area.

The Barroso region also focuses on livestock. This is grazed, for which forest pastures are also used. Since there is also snow and seasons with little vegetation in this region, hay is also used in Barroso. However, unlike hay farming, this is not the main focus of the farming system. In general, subsistence farming is practiced in Barroso, consisting not only of dairy farming but also of arable farming (rye and potatoes).

The society is different from that of the surrounding area in that Barroso has developed its own dialect and the people live in a kind of self-government. In contrast, the hay-milk farmers in the Austrian Alpine arc are not fundamentally different from the population in other Austrian regions.

##### Hay milk farming in the Austrian Alpine arc

Densely populated (in the inhabited valleys)

Mountainous area and foothills of the Alps

Small-structured, family-run farms

Mosaic-like cultivation of permanent grassland

Dairy farming as the main economic pillar; forestry, tourism, etc. serve as supplements

Mixture of livestock housing, free range and pasture (not shepherded), as well as alpine pasture farming

No joint management of public goods

ARGE Heumilch as representation of interests and control body, organized as an association (voluntary membership)

##### Barroso

Sparsely populated

Mountainous area and high plateau

Small-structured, family-run farms

Mosaic-like cultivation of all farmland

Subsistence lifestyle, farms produce much themselves, especially rye and potatoes; arable farming with crop rotation

(Forest) pasture

No common management of public goods

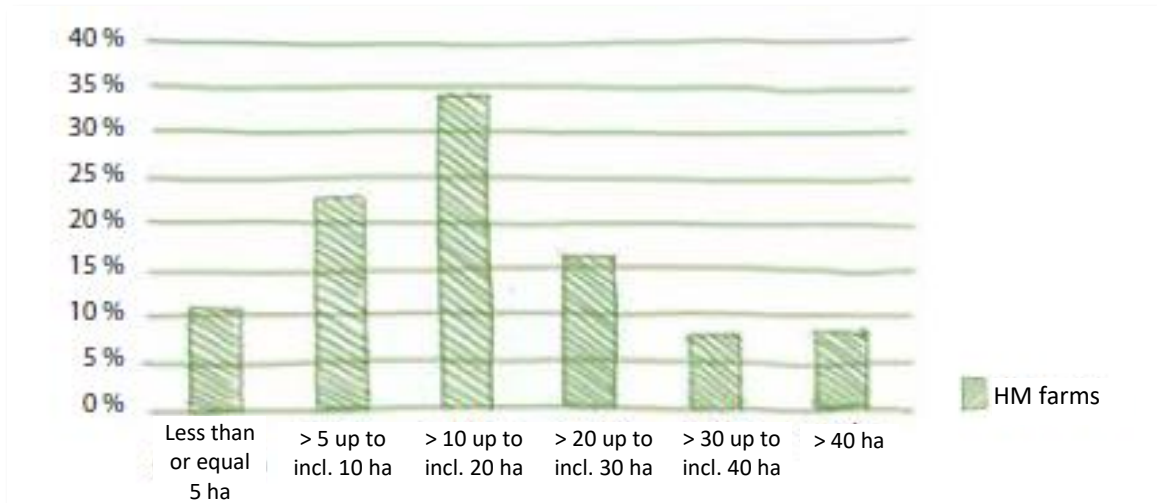
Culture and language differ from surrounding regions

## IV. GIAHS SELECTION CRITERIA

### 1. FOOD AND LIVELIHOOD SECURITY

#### 1.1. Preservation of small-scale farms

While the trend in agriculture is toward fewer and larger farms, hay farming promotes the preservation of small-scale farms. Despite progressive structural change, there is a large proportion of small farms in hay farming: almost 70% of hay milk farmers cultivate less than 20 ha of farmland.



Around 88% of hay milk farms are located in mountainous regions, where the farm size is naturally smaller due to the limited area. The average herd size is only 17 cows. The use of machinery is also limited in mountainous regions. Therefore, to make efficient use of the locally available resources, Alpine grazing has become established, with the animals being moved to mountain pastures during the summer months. With the help of cows, sheep or goats, the steep slopes and high altitudes are managed sustainably, where usually either cows or sheep or goats are kept.

Hay milk farmers accept more effort and a reduced milk volume for their sustainable farming methods. Many consumers appreciate sustainable dairy products and high-quality cheese and are therefore increasingly turning to products made from hay milk. This puts Alpine dairies, cheese factories and dairies in a position to pay their hay milk farmers a premium to compensate for the higher expense. In this way, hay milk farmers benefit from an annual added value of around 30 million euros, meaning that the continued existence of agricultural farms can be ensured.





Figure 24  
Family-run, small-structured farms

About 3/4 of the hay-milk farms only produce milk that is delivered to one of the processing companies.

Those that also use other distribution channels sell their milk or processed products mainly from the farm (approx. 15%). Only a very small proportion use sales channels such as the food trade, weekly markets or food co-ops.

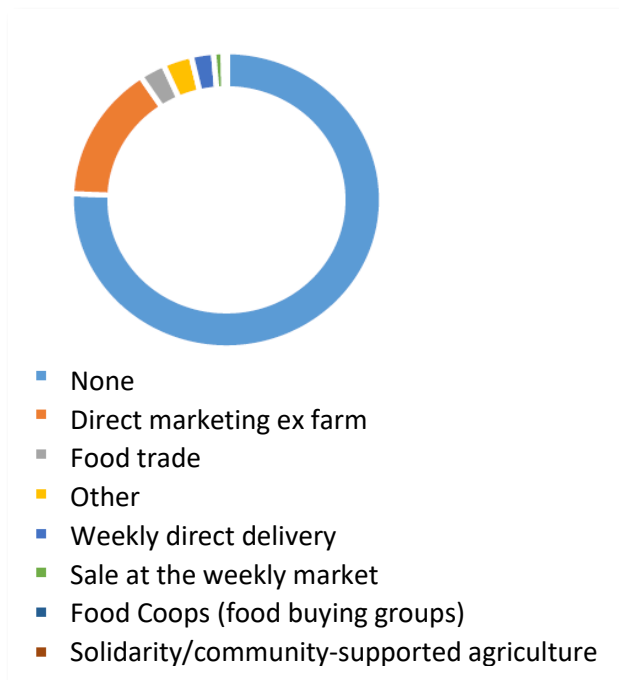


Figure 25  
Alternative marketing channels (besides the purchase of milk by dairies)<sup>56</sup>

<sup>56</sup> Zollitsch et al., 2019, p. 19



Figure 26  
female hay milk farmer in the  
lakeland region

Moreover, hay farming has always been traditionally practiced in the foothills of the Alps as well as in the lakeland regions. Here, the high water quality in the lakes in particular testifies to the sustainable farming practices of the hay milk farmers.

### Other economic sectors

Milk production is the main source of income for hay-milk farmers. However, many farmers also engage in other economic activities and diversify their farms:

- **Forestry:** Depending on the location, many farms also have forest areas in addition to permanent grassland, which are managed with varying degrees of intensity. Wood is often produced primarily for own use (from heating to building). However, wood is also traded.
- **Agricultural contract work**
- **Tourism:** "Farm holidays" in particular are a popular source of income that many farms use; but alpine pastures also profit from catering for excursionists.
- **Direct sale:** Milk, simple dairy products such as yoghurt and cream cheese, as well as meat and sausage, but also other self-produced products (bread, eggs, jams, soap, etc.) are marketed from the farm. Vending machines where products can be purchased 24/7 are very popular and simplify sales.
- **Selling of renewable energy:** Photovoltaic systems are used to operate hay drying systems. This is ideal because the peaks of energy demand and yield are covered in summer. Energy that is not consumed on the farm is traded. Since this is becoming increasingly lucrative, the PV systems are also being successively expanded.
- **Education:** Especially female hay-milk farmers often get involved by passing on their knowledge in seminars or by teaching schoolchildren about school on the farm.
- **Green Care:** Child care and care for the elderly are other mainstays that are mainly run by women farmers; however, the number of green care farms is relatively small.

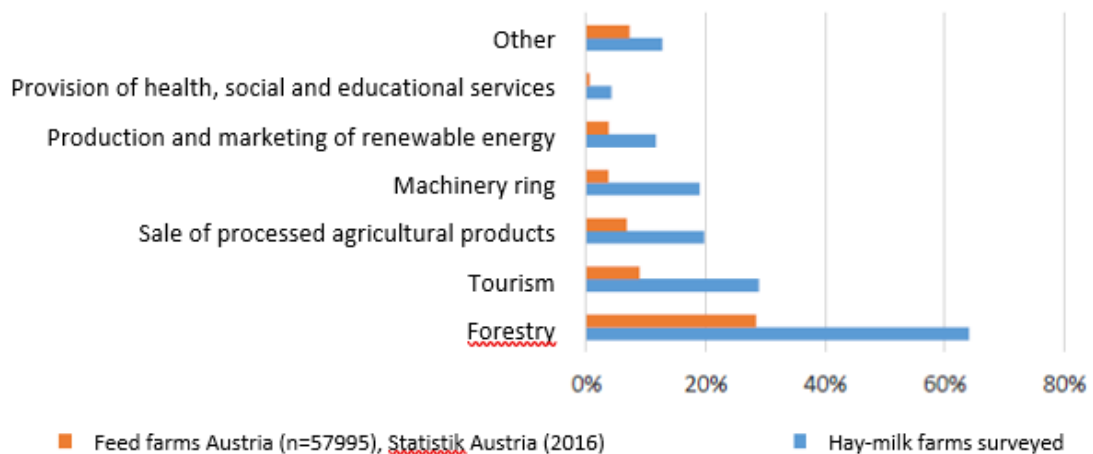


Figure 27

Proportion of farms with secondary agricultural activity (multiple answers possible)<sup>57</sup>

Often it is mainly the women farmers who are responsible for diversification. This is especially true in tourism, direct marketing, education and green care. The share of diversification is also higher on hay-milk farms than the national average.

In addition to the hay-milk farmers and their families, the processing companies with their employees are also involved in the "hay farming" system. The food trade also benefits from the system.

## 1.2. Processing plants

All the raw hay milk material is processed into high-quality food in the region. This creates jobs in the plants and the plants therefore also contribute to the infrastructure in the respective region. In this way, not only do the hay milk farmers benefit from the added value of hay farming, but also the entire region as a result.

ARGE Heumilch Österreich unites all major processors of hay milk in Austria. Among roughly 60 farms, there are farms with varying structures:

### Direct marketers

Direct marketing of farm products is becoming increasingly popular. Consumers are paying more and more attention to regionality and want to know where their food comes from. This encourages more and more farmers to process and distribute their products themselves.

### Cooperatives

The cooperative dairy/cheese factory is an association of several farmers. The milk is collected centrally and processed and marketed together, lowering the business risk for the individual. Members of the cooperative are given the right, but also the obligation, to deliver their milk to the cooperative.

The cooperative itself decides on the milk price, taking into account the market situation.

<sup>57</sup> Zollitsch, 2019, S. 18

### **Private companies**

In addition to self-marketing by farmers in direct marketing or cooperatives, private dairies and cheese factories of various sizes have developed in hay milk areas. In some cases, these farms have been processing the milk supplied to them by hay milk farmers into milk and cheese specialties for generations.

### **1.3. Contribution to food safety**

The crisis surrounding the Covid 19 pandemic in 2020 in particular, but also the current Ukraine war, have shown how important the supply of regionally produced food is. In their daily work, hay milk farmers make a significant contribution to this. Every day, they produce milk from the region for the region and, with their special farming method, also secure the living and economic space for future generations.

The paradigm shift toward sustainability and regionality is also reflected in the demand for food. There is an increasing demand for food that is healthy, sustainably produced and from the region. Hay milk and products made from hay milk meet these requirements perfectly and thus contribute to sustainable food security and food safety in the region.

Compliance with the TSG standard and the even stricter hay milk regulation is regularly checked by independent control institutes. This not only guarantees food safety, but also ensures the welfare of the dairy animals.

### **1.4. Product diversity**

Naturally, the products produced and marketed within the framework of hay farming are predominantly milk and dairy products. These are wide-ranging and feature regional specialties. What they all have in common is extremely high quality of the raw material, which results from the feeding method, the high biodiversity of the basic ration and the species-appropriate husbandry of the dairy animals.

### **Hard cheese**

Traditionally produced hard cheese is made exclusively from hay milk because this raw material is a prerequisite for long cheese ripening. In the process, it develops its malty, toasty flavours. With increasing maturation in the natural rind, which can last from three to twelve months and more, the typical aroma and taste gain intensity.



Mountain and Alpine cheeses are traditional here (Vorarlberger Bergkäse PDO, Vorarlberger Alpkäse PDO, Tiroler Bergkäse PDO, Tiroler Almkäse PDO). They are ripened with red culture, which means that the rind is maintained not only with salt water but also with red culture. Cheeses such as Emmental are only treated with salt water during the ripening process. Both processes favour the formation of the rind and serve to naturally preserve the cheese.

### Semi-hard cheese

This group of cheeses has the highest variety, with flavours ranging from mild to spicy and punchy. Semi-hard cheese is mostly produced from pasteurised milk. Its curd may be closed or have a break perforation. Large holes, as Emmental is known for, are also often typical for this variety.

Strong semi-hard cheeses are maintained with red cultures during the ripening process and usually ripen for several weeks. It develops malty, toasty notes reminiscent of light caramel or cookie. Mild varieties ripen in a special film for only a few weeks and have a slightly sour, milky-creamy character.



### Soft cheese

Soft cheese with white noble mould is produced by adding noble mould cultures to the milk or by spraying the surface of the cheese with these cultures. This group of cheeses is known for its mushroom-like flavors and they often resemble young wood or moss.

Soft cheese with red culture is maintained during ripening with brine and red culture bacteria, which turns the surface orange-red to brownish and gives the specific taste. The more mature the cheese, the more it develops creamy, malty flavours.

The ripening period of soft cheese is between three and six weeks. Young cheese initially has a pot-like curd and with age, the cheese acquires a creamy texture.



### Cream cheese and curd

Cream cheese is the only cheese that does not require a ripening period and can be enjoyed immediately after its production. Its texture is very soft and creamy. Fine yogurt or buttermilk flavors are typical and varieties with an increased fat level have a creamy characteristic. Cream cheese is easy to make:

milk is coagulated through the addition of lactic acid bacteria, sometimes also rennet. After cutting the curd into walnut-sized pieces, the mixture is poured into moulds and the whey drains off. It is often refined with fresh herbs or even flowers.



### Sour milk cheese

Sour milk cheese is the earliest form of cheese making, and is produced from quark. Its maturation is carried out with yeast and milk mould cultures from the outside to the inside. After about two weeks, the crumbly curd becomes more and more glassy and elastic in consistency.



Fresh yeast and buttermilk are clearly detectable on the palate and with age, these cheeses develop a complex flavour. Traditional varieties are Tyrolean gray cheese or Sura cheese. Sour milk cheeses are almost fat-free.

### Drinking milk

Drinking milk is a particularly valuable foodstuff because it contains many vital nutrients and is an important source of calcium for the formation of healthy bones and teeth. It also provides the body with sufficient protein, B12 and B2 vitamins. During production, drinking milk is centrifuged to set the desired fat content.



The milk is then homogenised to prevent fat particles from accumulating on the surface of the milk and pasteurised to ensure appropriate shelf life. It has a slightly sweet, creamy characteristic with subtle vanilla and almond flavours.

### Yoghurt

Yoghurt is one of the oldest dairy products. Freshly pasteurised milk is enriched with lactic acid bacteria and fermentation transforms part of the lactose into lactic acid. This is how the typical mildly sour taste is created.



A distinction is made between plain and stirred, creamier yoghurt. On the one hand, the firmness results from ripening in the cup, and on the other, because the yoghurt is not stirred after it has been thickened.

### Butter

In the production of sweet cream butter, butter cultures are added to the cream and beaten until the fat lumps - called butter granules - separate from the buttermilk. These are then kneaded to further reduce the water content. It has a mild creamy taste.



In small alpine dairies and cheese factories, sour cream butter is often traditionally produced from thermised milk or raw milk. In this process, the cream is pre-ripened overnight with special acidifying cultures and only then whipped into butter. The flavour of this butter is usually more complex with fresh acid notes.

### Byproducts of cheese production

Cheesemaking produces whey as a by-product. This can still be processed into whey cheese. These lean cheeses were traditionally the cheeses of poor people: while the fat cheeses were sold, the farm family itself ate the whey cheese. Traditional whey cheeses are, for example, the Ziger in Tyrol or the Almschotten, which is common in Pinzgau and Pongau. The Sig from the Bregenz Forest in Vorarlberg is also a whey cheese.



However, whey is also marketed as a beverage and is especially popular as a fruit whey.

#### 1.1. Cultural landscape and tourism

Hay farming, which has been cultivated and developed over centuries in the Austrian Alpine arc, has created a characteristic cultural landscape. This characterises the region and makes a decisive contribution to its success as a tourist region. Without the permanent grassland of the hay-milk farmers and without the cultivated alpine pastures, the region would not be so successful in tourism.

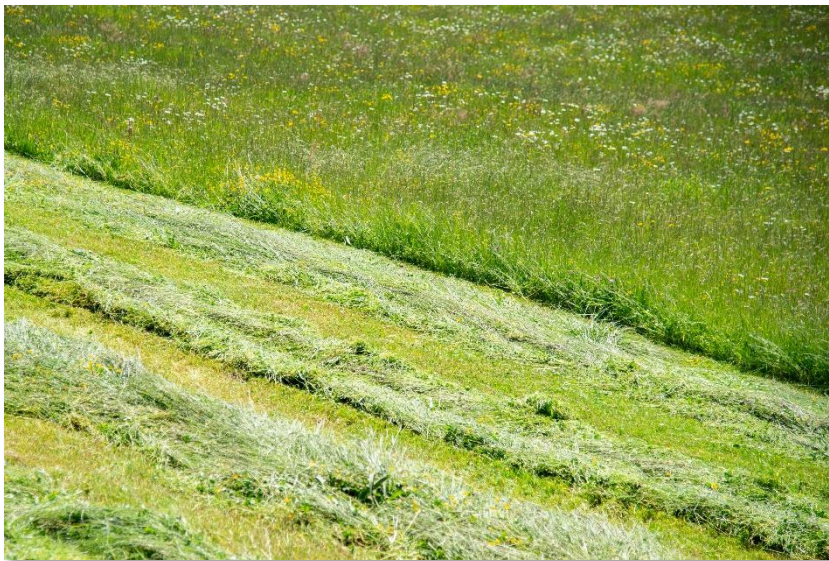


*Figure 28  
Haymaking creates a cultural  
landscape that is a basic  
prerequisite for tourism.*

## 2. AGRO-BIODIVERSITY

More than two thirds of the agricultural land in the hay-milk regions is grassland. Here, unique cultural landscapes are found that are home to a variety of different grass and herb species. The sustainable management of permanent grassland represents the central core of hay farming. **The mowing is staggered in time and space.** This preserves refuge areas for zoological species and promotes their existence. In addition, a later first cut as well as fewer cuts promotes species diversity.

On average, hay farms have a lower frequency of use than silage farms. The predominantly lower frequency of use can be attributed to the fact that the farms are more dependent on suitable weather conditions (longer periods of good weather) for haymaking and that hay drying is only possible to a limited extent in May and from mid-September. This is also reflected in the timing of the first cut - most hay farms mow one to four weeks later than comparable silage farms.<sup>58</sup>



*Figure 29  
Staggered mowing in terms of  
time and space has a positive  
effect on the preservation of  
biodiversity.*

The first time of use has a decisive influence on the height of the vegetation and thus also on the living conditions of invertebrates (more or longer available habitat)<sup>59</sup>. From a nature conservation perspective, grassland intensification (use of fertilisers and pesticides) is largely responsible for the progressive decline in species. Increasing silo farming, also in the uplands, leads to a significant advance of the first mowing (depending on weather and location, already from the end of April) and to a homogenisation and trivialisation of the botanical and zoological species assemblages on the areas.

The time of the first mowing was originally (historically-traditionally) between mid to late June (planar and colline stage) or early to mid to late July (submontane to montane stage), depending on altitude, whereby less productive areas such as rough and wet sites were often mown even later. In contrast, for the production of high-quality forage, cutting is required about 6-8 weeks earlier, while the above-mentioned "historical" mowing dates are still quite suitable for hay use today.<sup>60</sup> In addition, silage

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<sup>58</sup> Suske W., Depisch B., Huber J., Frieß T., Holzinger W., Derbuch G., Kahapka J., Huber E., Gunczy W.L.: Analyse der Zielerfüllung der ÖPUL-Maßnahme „Silageverzicht“ in Bezug auf Biodiversität; Vienna, 2020

<sup>59</sup> Brabant D.: Naturindikatoren, Entwicklung eines Instruments zur Erfassung von Naturschutzleistungen im landwirtschaftlichen Betrieb. Dissertation Universität Kassel, 2006

<sup>60</sup> Schröder S., Wider J.: Agrobiodiversität im Grünland – nutzen und schützen; Schriftenreihe des Informations- und Koordinationszentrums für Biologische Vielfalt, Band 34; 2013



allows more frequent cutting and therefore also leads to more fertilisation in grassland and on arable forage areas, which has negative effects on biodiversity.

According to the Environmental Ombudsman Board Tyrol (2009), good grass silage requires young, protein-rich grass ("ear-panicle pushing"), i.e. that mowing is done earlier and more often than for hay production. This intensive form of management has a side effect on the species composition. Typical meadow flowers, such as lesser meadow-grass and meadow sage, do not reach seed maturity and cannot reproduce. Only a few meadow plants, mostly fast-growing and/or vegetatively reproducible grasses, can withstand the intensification. As a result of silaging, food chains are destroyed. Many forage plants and the insects that specialise in them, such as grasshoppers, butterflies, etc., disappear from once species-rich meadows.

A report by the International Lake Constance Foundation in Radolfzell<sup>61</sup> on biodiversity criteria in standards and quality seals of the food industry states that haymaking with site-adapted and less intensive grassland use contributes to the preservation of biological species diversity.

A study by the Institute Suske Consulting Vienna<sup>62</sup>, in which hay management was analysed in relation to the preservation of biodiversity, also confirms positive effects. Due to a later first cutting date and a lower intensity of use, it is shown that the hay meadows were on average higher than the silage meadows in June and the growth height was more diverse in the hay meadows in the course of the vegetation period. Thus, a positive effect of the mowing mosaic and a later first cut can be proven for biodiversity.

These results clearly show that the prerequisites for serving as a habitat for insects are met to a greater extent on the hay farms than on the comparison farms. The study also analysed mowing data from 2019 and 2020. In six out of nine farm pairs, hay farms mowed on average a significantly smaller proportion of the meadows at one time than silage farms.

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<sup>61</sup> Internationale Bodensee-Stiftung Radolfzell: Baselinereport, Biodiversitätskriterien in Standards und Qualitätssiegeln der Lebensmittelbranche; 2013.

<sup>62</sup> Suske W. et al. 2020

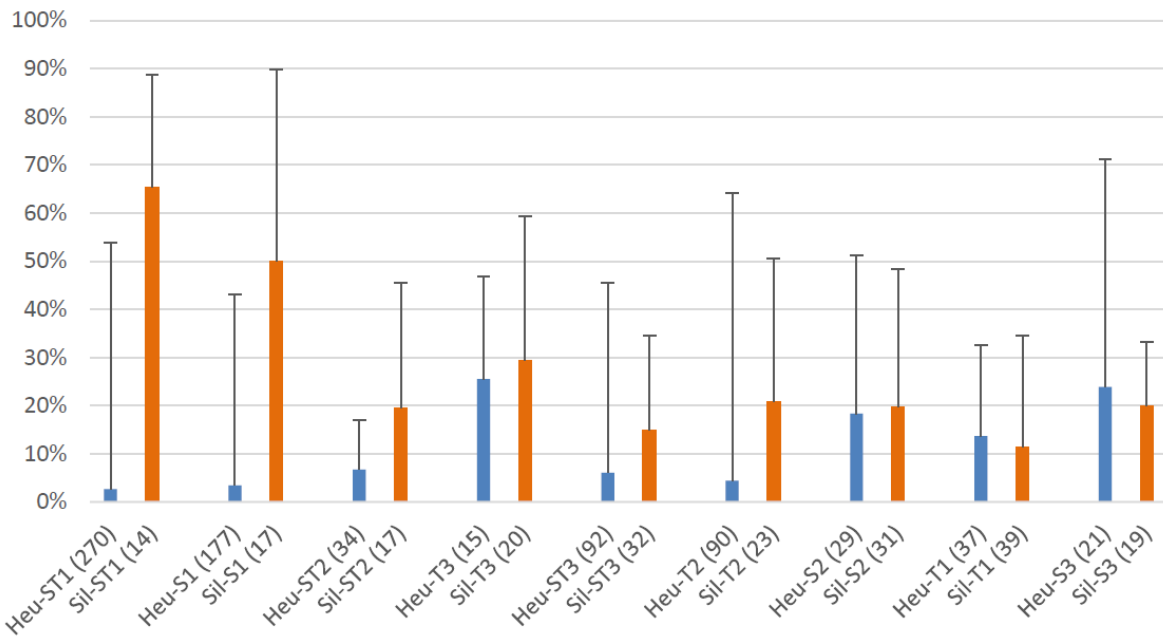


Figure 30

Average share of mown area on mowing days in relation to the total grassland area (incl. temporary grassland used as grassland, excl. arable land and temporary grassland used as arable land) in 2019 and 2020. The error bar indicates the maximum share of mown area. The numbers in brackets indicate the number of mowing days used for the calculation.

In the course of these ecological investigations, the vegetation height of the investigated areas was also measured using Pasture Disc and by farmers themselves on selected areas. Figure 31 Average meadow height in cm on the direct comparison plots with 6 measurements shows the vegetation height over the course of the year. The hay plots (blue) reached higher average values from mid-June and through midsummer. This is an indication of the later mowing of the hay meadows and supports the results presented above, according to which the hay farms tend to have a larger mowing mosaic.

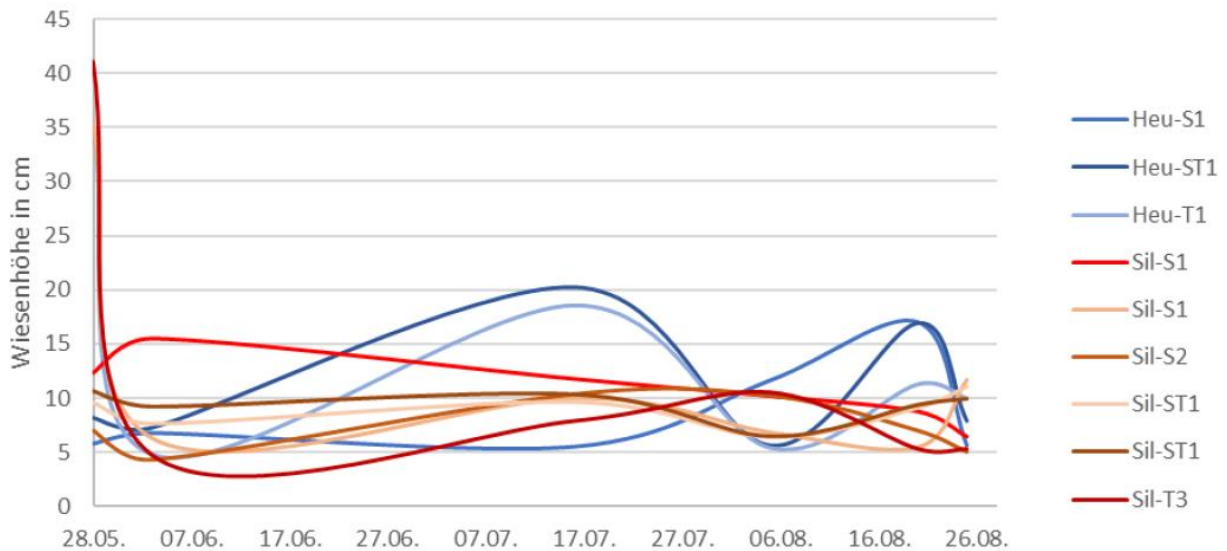


Figure 31

Average meadow height in cm on the direct comparison plots with 6 measurements.

The mowing times on hay farms are more staggered in terms of time and space. This means that not all grassland is mown at once and important food sources and refuges for bees, butterflies or small game are preserved.



Figure 32  
Areas are mown in staggered time and space, creating a mowing mosaic

The higher field size of silage farming also has a negative impact on biodiversity. The Environmental Ombudsman's Office Tyrol (2009) states that the production of silo bales makes it possible to mow large areas of meadows within one day. For many animal species there is no possibility of retreat in this case, small animals are packed in with the silo bale production. Staggered cutting is necessary from the point of view of biodiversity protection. Furthermore, hay drying on the field ensures that seeds mature and fall out, thus renewing the seed supply in the soil. Small animals are able to leave the cuttings.

Haymaking, with its traditional farming methods, helps to reduce the decline in species and to preserve the valuable cultural landscapes in the long term. In this way, different types of meadows, pastures and alpine pastures are preserved and provide important habitats for flora and fauna.

<b>Subarctic-subalpine tall shrublands</b> <i>Mulgedio Aconitetea</i>	Subalpine-alpine hayfields <i>Rumicetalia alpini</i>
<b>Arid, semi-arid grasslands and basophilic calcareous grasslands</b> <i>Festuco Brometea</i>	Continental dry grasslands and eastern European steppes <i>Festucetalia valesiaca</i>
	Semi-arid grassland <i>Brometalia erecti</i>
<b>Subalpine-alpine calcareous grassland</b> <i>Seslerieta albicantis</i>	Calcareous grassland <i>Seslerietalia caeruleae</i>
<b>Subalpine-alpine acid soil grasslands</b> <i>Caricetea curvulae, Nardetea strictae</i>	Acid soil high mountain steppes of the Alps <i>Caricetalia curvulae</i>
	Acid soil windheum harvester <i>Festucetalia spadiceae</i>
<b>Nutrient-rich mowed and litter meadows, pastures, floodplain and turf grasses</b> <i>Molinio Arrhenatheretae</i>	Fertilised fresh meadows and pastures <i>Arrhenatheretalia elatioris</i>

	Alpine meadows and pastures <i>Poo alpinae-Trisetalia</i>
	Wet meadows and tall herbaceous vegetation <i>Molinietalia</i>
<b>Larch meadows</b> <i>Vaccinio Piceetea</i>	Larch meadows <i>Vaccinio Piceetea</i>

Table 1

The different types of meadows, pastures and alpine pastures

A list of the plants that are usually found in hay-milk meadows can be found in Appendix 3 to this application.

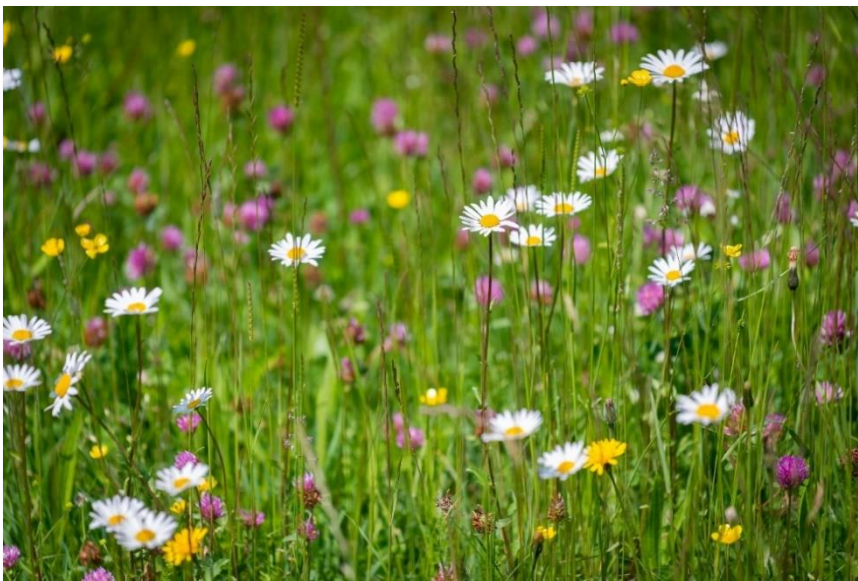


Figure 33  
Meadows can mature and are only mown when a variety of grasses and herbs are in flower.

### Biodiversity in the Alpine region

About 88 % of hay-milk farms are located in mountain areas. In order to make efficient use of the locally available resources, alpine pasturing with the removal of the animals to the mountain pastures during the summer months has become established in these regions.

In these areas, the loss of species is due to the abandonment of the use of low-yielding areas such as rough pastures, dry grasslands or wet meadows. Hard-to-farm, steep slopes are primarily affected. The end of grassland use here often means afforestation<sup>63</sup>, scrub encroachment and reforestation, or the invasion of alien species that form permanent mass stands. In any case, it leads to the loss of characteristic species, some of which are threatened with extinction.

Plants typically found on these areas:

Poa alpina	Alpine bluegrass
Crepis aurea	Golden Pippa
Nardus stricta	Borstgrass

<sup>63</sup> Bätzing, Werner: Die Alpen. Geschichte und Zukunft einer europäischen Kulturlandschaft; München 2015, p. 264ff

Crocus albiflorus	Spring crocus
Veratrum album	hellebore
Geum montanum	Mountain carnation-wort
Festuca nigrescens	Horst red fescue
Galium anisophyllum	Odd-leaved bedstraw
Leontodon hispidus	Stiff-haired dandelion
Rumex alpinus	Alpine buttercup
Ranunculus acris	Sharp buttercup
Ajuga pyramidalis	Pyramid Goosegrass
Antennaria dioica	Common cat's foot
Arnica montana	Mountain arnica
Carlina acaulis	Silver thistle
Deschampsia cespitosa	Lawn Sedge
Gentiana acaulis	Cook's gentian, stemless gentian
Lotus corniculatus	Common Horn Clover
Myosotis alpestris	Alpine Forget-me-not
Potentilla aurea	Golden cinquefoil
Pulsatilla alpina	Alpine cow parsley
Rumex alpestris	Mountain Sorrel
Trifolium badium	Brown Clover
Tussilago farfara	Coltsfoot

Table 2

Source: Peter Schönswetter, University Innsbruck

In most cases, alpine pastures are cultivated areas that have been created through decades - sometimes centuries - of cultivation. Through alpine pasture management and the grazing of hay farms, these areas remain open.

*"A typical alpine meadow is home to up to 100 different plant species (in comparison: in the valleys there are on average only 20), from grasses and spring flowers to medicinal herbs and shrubs. However, the exact composition of the vegetation varies from alpine pasture to alpine pasture and depends on factors such as the altitude, the subsoil, the slope and the management of the alpine pasture. Without active management of the alpine pastures, most of the terrain up to about 1,500 metres would be continuously forested, the lush meadows and pastures would not exist and many rare plants would have no habitat.*

*Alpine meadows are not only relevant for their beauty and biodiversity, but of course also as a source of fodder. Particularly valuable - nutrient-rich - alpine pastures can be recognised by the presence of meadow golden oat, meadow fescue, red fescue, red bunchgrass, meadow crested wheatgrass, alpine bluegrass, alpine timothy, golden pippa, rough dandelion, alpine motherwort, alpine plantain, red clover, white clover and brown clover, among others. This species-rich composition of the forage pastures on the alpine pastures are decisive factors that guarantee the alpine pasture products, such as meat, milk and cheese, a particularly high quality.*<sup>64</sup>



In addition, managed pastures and alpine meadows provide a deep-rooted carpet of grass that can withstand adverse weather conditions and better resist landslides. Regular mowing and grazing creates well-kept meadows with short vegetation that hold snow better. If the areas are not cultivated, long, unmown grasses are pressed to the ground by the snow load and form ideal slide ramps on which snow slabs can easily detach and become an unpredictable avalanche hazard.

So-called "blaiks" (extensive soil erosion) also occur: *"The long grass lies down in autumn and then freezes into the snow. When the creeping snow then slowly pushes down the slope, the grasses are torn out of the ground along with their roots. The rain in summer then washes away more soil and these blaiks enlarge."*<sup>65</sup>

Figure 34  
"Blaiks", from: Bätzing W., p. 281

### **Fewer cuts require less fertilizer**

Meadows are grassland used for agricultural purposes by mowing. This form of land use on large areas is very young from a historical perspective (Bunzel-Drüke et al. 2019). Motorisation is about 100 years old, intensification to 4 or more cuts per year, combined with multiple fertilisation, only began in the 1960s (Kapfer 2010). Besides the start and frequency of cutting, the fertilisation intensity of the areas is an important factor for the biodiversity that accompanies the intensification of land use.

Modern intensive dairy production drives intensification of use, as it requires a high quality of grassland silage and thus also a higher, withdrawal-oriented fertilisation level. Therefore, early cutting for silage production is now required for intensive dairy farms in both conventional and organic farming.<sup>66</sup> Earlier mowing has become widespread in practice due to the increasing production of grass silage instead of hay.<sup>67</sup>

<sup>64</sup> <https://www.unsere-almen.at/natur/flora/wald-und-wiese>

<sup>65</sup> Bätzing, W., 2015; p. 281

<sup>66</sup> Schröder et. al., 2013

<sup>67</sup> Gerowitt B., Schröder S., Dempfle L., Engels E.-M., Feindt P.H., Graner A., Hamm U., Heißenhuber A., Schulte-Coerne H., Wolters V.: Wissenschaftlicher Beirat für Biodiversität und Genetische Ressourcen beim BMELV

According to the Tyrolean Chamber of Agriculture (Dr. Kutny, Plant Production), the meadow type English ryegrass mowing pasture is a frequently occurring, intensively used permanent meadow whose cut is mainly used as silage. As silage is cut more often, there is a risk that the grassland will also be fertilised more frequently. This also has an impact on the species composition.

In order to compensate for the constant nutrient removal through more frequent mowing, the areas are fertilised more intensively, adapted to the removal. Since nutrients introduced through fertilisation are available more quickly than those that first have to be converted in the soil from dead plants, the external supply favours those species that have a good nutrient suitability capacity and that can thus develop into dominant species. If these are species with beneficial ingredients, this process increases the quality of the fodder produced from an agricultural perspective<sup>68</sup>, while the biodiversity and nature conservation value of the land decreases as a result.

### **Austrian Environmental Programme**

Hay-milk farms have to participate in the **Austrian Agri-environmental Programme** (ÖPUL – Österreichisches Programm für umweltgerechte Landwirtschaft), which is established within the framework of the Common European Agricultural Policy. It is mandatory to implement the guidelines of the measures "hay management" and "environmentally sound and biodiversity-promoting management".

In the measure "Hay Management", in addition to the renunciation of silage preparation and feeding on the entire farm, a mosaic-like use (mowing mosaic) of the land by combining hay management with green fodder in the form of grazing or pasture must be ensured for all roughage-consuming animals on the farm during the major part of the vegetation period.

In the measure "Environmentally sound and biodiversity-promoting management", 7% biodiversity areas are mandatory, up from 5% until 2022. As a result, from 2023 onwards, around 30 percent more biodiversity areas will be managed by hay-milk farmers.

Furthermore, 83% of hay-milk farms participate in the animal welfare measure "pasture" and 88% in the measure "ban of yield-increasing inputs (mineral fertiliser, synthetic pesticides) in grassland". Hay-milk farms have 28% HNVF areas (high nature value farmland). This is more than twice as much as on silage farms with 13%. Pasture farming in particular will become even more important in the future because, in addition to the benefits for animal welfare, it also makes a significant contribution to reducing emissions, as the excreta of the animals are directly returned to the soil as natural fertiliser. Moreover, pasture farming promotes biodiversity, provides a natural habitat for numerous life forms, especially insects, and ensures high soil fertility through humus build-up. Agricultural monocultures are at a clear disadvantage here.

The reduction of concentrated feed and the thus potentially reduced nitrate input, the small field sizes, the generally more environmentally friendly management and the low use of yield-increasing inputs as well as the management of alpine areas and extensively managed pastures and HNVF areas are important biodiversity indicators of hay farming in Austria.

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(2013): Biodiversität im Grünland – unverzichtbar für Landwirtschaft und Gesellschaft. Stellungnahme des wissenschaftlichen Beirats für Biodiversität und Genetische Ressourcen beim Bundesministerium für Ernährung, Landwirtschaft und Verbraucherschutz

<sup>68</sup> Gerowitt et al, 2013

## Breeds of cattle

Since the end of the 19th century, there have been efforts to systematically improve cattle breeding in the region.<sup>69</sup> However, this has led to a standardisation of the breeds. Some local breeds have been pushed back and were only systematically bred and preserved again from the end of the 20th century.

The Fleckvieh is the most widespread breed of cattle in the Alps and the Alpine foothills. Their distribution range extends from the lowlands of eastern Austria to west Switzerland, i.e. across the entire hay milk region. After the Fleckvieh, the Braunvieh is the most important breed for milk production, which, according to its original breeding area, is very well established in west Austria. The breed is found mainly in regions where hard cheese is traditionally produced.



*Figure 35  
The Fleckvieh is the most  
common breed of cattle in the  
Alps.*

In addition to milk yield and meat quality in the Alpine region, a certain cross-country capability also plays a major role in the distribution of the breeds. Not all breeds are equally suitable for Alpine grazing. The breed typically found in the mountainous regions of the Eastern Alps is the Tyrol Grey, while the Pinzgauer is mainly distributed across the Hohe Tauern National Park region.

It is also interesting to note that different breeds of cattle are kept on hay milk farms compared to silo farms. This is evidenced by the Invekos Data Pool 2018<sup>70</sup> of the Federal Ministry of Agriculture, Forestry, Regions and Water Management. The much higher proportion of brown cattle on hay milk farms is significant. Breeds raised in small-scale hay farming also appear to be more resistant to climate change-induced higher temperatures.<sup>71</sup>

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<sup>69</sup> Wopfner, S., 1997, p. 188f

<sup>70</sup> Zit. Nach Zollitsch W., 2019, p. 20

<sup>71</sup> Zollitsch W., 2019, p. 20f





*Figure 36  
Brown cattle are particularly  
widespread on hay milk farms.*

Alpine pasture farming makes different demands on the physiognomy of dairy animals than keeping them on the plain. Smaller and lighter breeds that can make good use of the fodder on the alpine pasture and that also have hard hooves and a certain cross-country mobility are more suitable for alpine pasture. Regionally, different breeds are used, some of which belong to the endangered cattle breeds. In Tyrol, for example, in addition to the generally widespread breeds, the Tyrolean Grey cattle (76.92% of the Grey cattle in Austria are kept in Tyrol) and the endangered breeds Tux-Zillertaler (60.95% of the Tuxer in Austria are kept in Tyrol) and Original Braunvieh are found. Pinzgauer, on the other hand, are kept with preference in the province of Salzburg (48.97% of Pinzgauer in Austria).



Figure 37  
Tyrolean Grey Cattle...



*...and Pinzgauer are particularly cross-country capable breeds of cattle and are therefore readily used and put out for grazing in mountainous regions.*

Some endangered breeds are deliberately bred on in the hay farming industry. They are usually particularly robust, which is an advantage for hay farming. These include, for example, the Tux-Zillertals, which are particularly good off-road performers, but also excellent feed converters on extensive areas. This makes them particularly suitable for Alpine grazing.

Similarly robust is the Ennstaler Bergscheck, which finds its distribution mainly in Styria. They are considered to be particularly durable.

The calm and robust Carinthian Blondvieh is also well suited to Alpine grazing.



Figure 38  
*Ennstaler Bergschecken*



Figure 39  
*Tux-Zillertaler*



Figure 40  
*Carinthian Blondvieh*

The original Pinzgauer is equally hardy and capable of off-road use, and is also said to have a high temperature tolerance and be less sensitive to UV radiation. This makes them particularly suitable for use at higher altitudes.

A distinction is made here between a chestnut-brown, genetically hornless "Jochberger Hummeln" breed and the black and white "Glückskühe".



*Figure 41  
Original Pinzgauer as  
"Jochberger Hummeln".*



*...and the black and white  
"Glückskühe"*

It should also be noted that dual-purpose breeds are used in hay production (milk and meat), above all the Fleckvieh. Considered as a system, this is particularly sustainable because not only the milk is

utilised, but the whole animal. There are also local marketing initiatives for the meat of the animals (e.g. for alpine beef).

### Sheep and goats

Besides cattle, sheep and goats also play a role in hay farming. As ruminants, they also convert biomass that cannot be used by humans into valuable foodstuffs, and since 2019, sheep's and goat's milk has also carried the EU TSG quality seal - "traditional speciality guaranteed".

The share of sheep's and goat's milk as well as lamb meat is very small compared to cow's milk and beef. In Tyrol, however, it is significantly higher than average.

Product	Bgld.	Ktn.	NO	OO	Sbg	Stmk.	T	Vbg	W	Austria
Cattle	2.1	17.6	7.9	13.3	17.5	10.2	17.0	16.0	0.1	10.8
Pigs	2.9	8.7	9.5	18.6	1.2	16.6	0.7	0.7	0.1	11.4
Sheep and goats	0.1	1.1	0.3	0.4	0.8	0.4	1.7	0.7	0.0	0.5

Figure 42

Share of agricultural production by federal state in %.<sup>72</sup>

In hay farming, both the sheep and goats used are mainly pure dairy breeds. In terms of goats, these are predominantly the Saanen goat and the chamois-coloured mountain goat. Occasionally, however, Toggenburg goats are also used.



Figure 43  
Saanen goat

<sup>72</sup> Statistik Austria: Landwirtschaftliche Gesamtrechnung 2019, p. 14



Figure 44  
Chamois-coloured mountain goat



Figure 45  
Toggenburg goat

In terms of sheep, it is predominantly the Lacaune sheep that is used as a dairy sheep in hay farming.



Figure 46  
Lacaune sheep

### 3. LOCAL AND TRADITIONAL KNOWLEDGE SYSTEMS

Throughout the centuries of hay farming, a lot of local and traditional knowledge has been accumulated, which ARGE Heumilch tries to preserve. Modern hay farming also transfers old technologies into the new era and makes the farming method attractive and even more sustainable for young and modern farmers.

#### 3.1. Hay harvest and hay quality

Hay harvesting is a definitive part of hay farming. Particularly in mountainous regions, numerous slopes do not permit machines due to their steep descent - they are mowed by hand with great effort. Harvesting quality hay requires expertise, up-to-date technology and good weather conditions - only then can high-quality hay be harvested for the winter season. The animals are usually given a mixture of the different hay cuttings to be able to guarantee nutrient-rich feeds. The grass and hay cuttings given provide a little insight into the "craft" of haymaking.



*Figure 47  
High quality hay is the basis for  
winter feeding*

- **First cut:**  
The first cut provides 30 to 40% of the year's forage and is also much richer in structure than subsequent cuts. Structure-rich grass and hay is important for the ruminant activity of the animals. This first cut is harvested in several batches through pasture farming, green grass feeding and hay mowing. The first cut already delivers different qualities of hay:
  - a. Young, high protein and energy-rich quality hay for dairy cows.
  - b. Quality hay mowed 1 to 3 weeks later for good yields.
  - c. A little later: hay in full bloom for pregnant cows and larger young cattle.
- **Second cut:**  
From the second cut, the structure in the feed decreases, while the herb content increases significantly. Hay from the second cut is therefore finer, has a very pronounced flavour and provides a very good protein yield.

- **Third cut:**  
The third cut is already much lower in quantity, but delivers very high crude protein yields. This allows purchased protein feeds such as grains to be replaced for the most part. This cut ensures a high yield from the proprietary herb-rich permanent grassland stocks.
- **Fourth cut:**  
A fourth cut is no longer possible in many hay milk regions as altitude increases. Instead, a valuable autumn pasture for hay milk cows takes place on the land.

### 3.2. Development of haymaking

For thousands of years, grass has been dried in the region in summer to be fed to ruminants as hay in the winter when there is no vegetation. However, the technique of harvesting and drying the grass has evolved in recent years and also shows regional differences. The result, however, is always hay that serves as basic fodder for the winter months.

Traditionally, the hay is already dried in the meadow - so-called "ground hay". The effort in muscle power and time was very high and the dependence on the weather enormous, because the weather had to be dry for several days. Both the workload and the stress of the weather placed great burdens on farming families.



Figure 48  
*The cut grass was turned by hand.*





*Figure 49*  
*So-called "Heumandl" were used to bring the wet hay away from the ground to dry.*



In addition, there is a higher crumble loss with ground hay than with under-roof drying. The drier the hay, the more brittle it becomes. When it is then harvested dry, valuable plant parts break off and remain on the meadow. For this reason, the basic forage quality of ground hay is lower than that of hay dried under roof.

Hay is still harvested from the ground on hay-milk farms. In contrast to the past, this is now done with machinery. However, the hay is hardly ever hung up anymore, but turned several times on the ground until it is dry enough for harvesting. Wherever possible, turning is done mechanically with a rotary harvester attached to a tractor. The use of machinery means that haymaking is no longer as laborious and physically demanding as it used to be. Nevertheless, the amount of work involved in this haymaking method is still very high and the dependence on the weather is greatest. Crumble losses are also still an important factor.

The different techniques are also used in parallel, depending on the nature of the grassland and forage requirements.



*Figure 50  
Today, the Kreisler usually does  
the turning. (Source ©Pöttinger)*

A survey in 2016 showed that only slightly more than a quarter (28%) of farms still harvest hay exclusively as ground hay. The trend is towards drying systems, which help to make hay farming more efficient and higher-yielding without changing the basic principle of the farming method.

### **Drying systems/Under-roof drying**

Today, however, more often than dried in the meadow, the hay in the meadow is only pre-dried and then brought into a drying plant while still damp (residual moisture approx. 30%), where it is finish-dried in a controlled manner. This method has two main advantages over ground hay:

- For one thing, there is less dependence on the weather, as the time window in which it is not allowed to rain is much smaller. This leads to less stress for the farmers. The harvest time can be chosen more flexibly and better adapted to the degree of maturity of the meadows.
- On the other hand, this controlled drying under cover increases the quality of the forage and thus the yield. There is less crumble loss in the meadow because the grass is more elastic while it is still damp. Valuable components are preserved, the harvest yield increases by up to 30% compared to ground hay, which significantly improves the economic situation of hay-milk farms.

Due to the dehydration, the living conditions for bacteria and fungi deteriorate to such an extent that they can no longer work. This happens from about 13 % residual moisture or 87 % dry matter. This ensures that the hay can be stored well. With simple forms of hay drying such as ground hay, these values are very rarely achieved in practice, which means a loss of quality when storing the forage. With under-roof drying, these values are achieved, which is important for a lasting high quality of the hay.

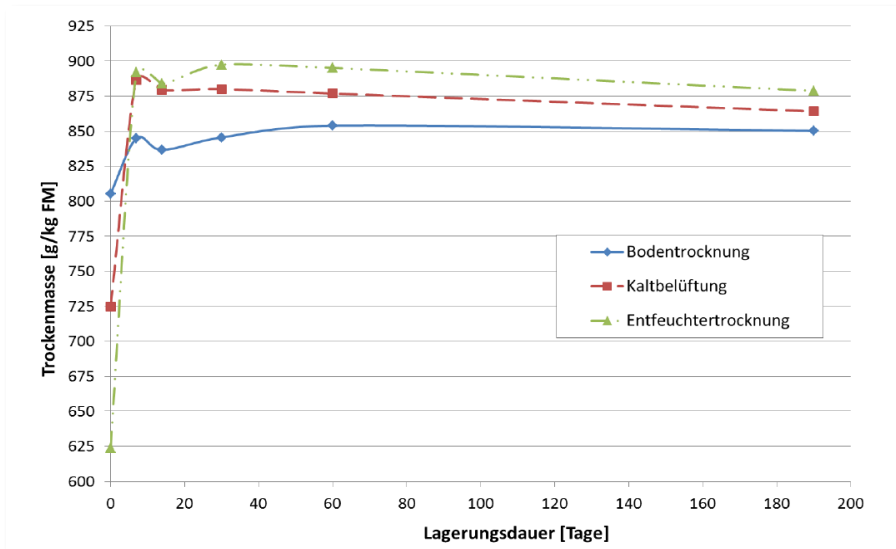


Figure 51  
Course of the dry matter content during hay preservation<sup>73</sup>

Various systems are available for under-roof drying, which are now operated with renewable energy systems (photovoltaics, wood chips).

Technical drying requires at least one ventilator that blows air into the loose or baled fodder. If the air sucked in by the ventilator is processed by a heat generator or an air dehumidifier, the drying performance increases enormously. For high fodder quality, rapid drying to the point of storability is a prerequisite.

The largest share of under-roof drying is accounted for by loose drying in hay boxes, bale drying plays a smaller role. The share of under-roof drying is steadily increasing, but there are no more recent data than those from 2016. In the meantime, the share of hay dried under roof is likely to be much higher.

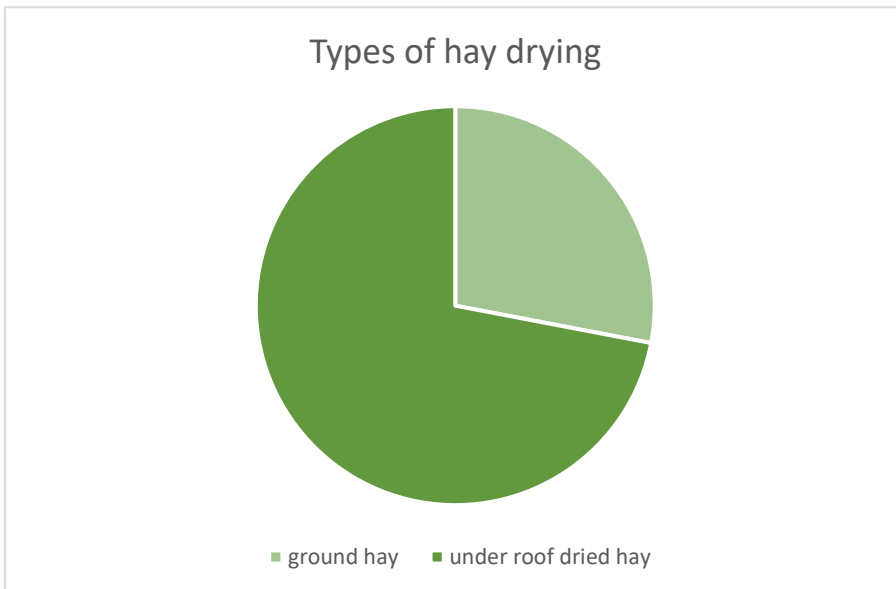


Figure 52  
Drying types, source: own survey 2016

<sup>73</sup> Lindner, Gerhard; Kittl; Matthias: Heumilchproduktion in Österreich. Bestandserhebung und Implikationen für die Weiterbildung und Beratung; Vienna 2016, p. 21

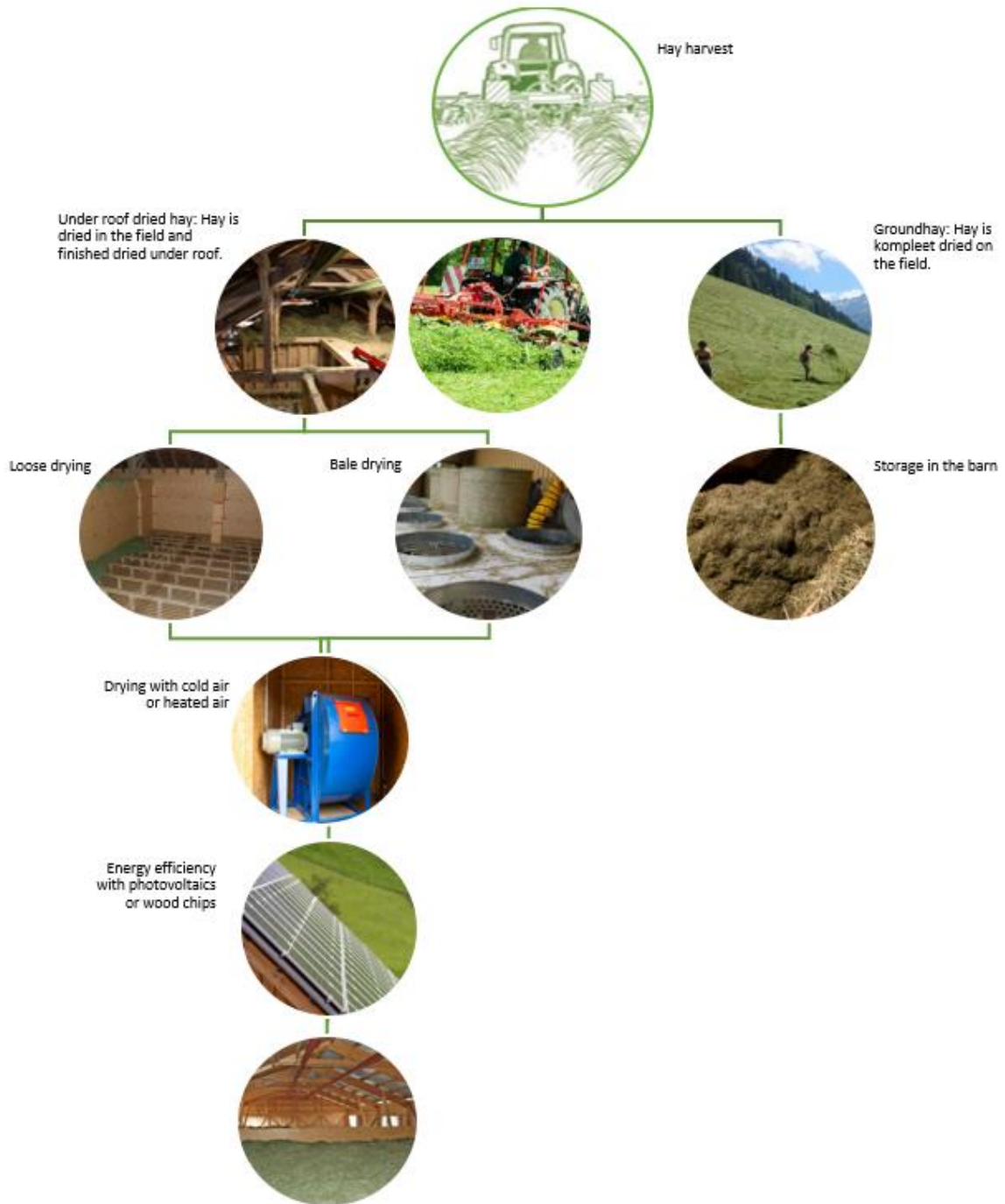


Figure 53  
Drying types and systems

### Types of underroof drying in detail

#### a) Loose drying

In loose drying, the hay is finished in large boxes lying on a grid, for which there are various methods. Depending on the location and needs, the loose hay is dried with cold air, heated air, dehumidifiers or a combination of these.



Figure 54

*In hay boxes, the hay is placed on a simple grid under which the air is blown in.*

The forage quality can thus be decisively increased and the proportion of concentrated feed in the feeding can be further reduced. Since the energy required for aeration is often covered by photovoltaics, these systems are operated in an extremely environmentally friendly way. Farmers benefit from hay drying systems through simplified hay harvesting, less dependence on the weather and higher profitability through increased forage yields.

Loose drying is the most common form of drying.



Figure 55

*The hay is placed loosely in large boxes and finished drying in them.*



*Figure 56*  
*A ventilator blows (warm) air into*  
*the hay.*

### **b) Bale drying**

Another form of under-roof drying is bale drying. In this process, the still moist hay is pressed into bales and ventilated and dried in this form. There are different variants of how the air is blown through the bales. Bale drying is more expensive than bulk drying, but it has the advantages that storage does not have to take place close to the barn and the hay can be stored and transported more easily and, if necessary, also traded. However, bale drying has not really caught on and the proportion of farms that dry their hay in the form of bales is in the single-digit percentage range.



Figure 57  
In bale drying, the moist hay is pressed into bales and the bales are aerated.

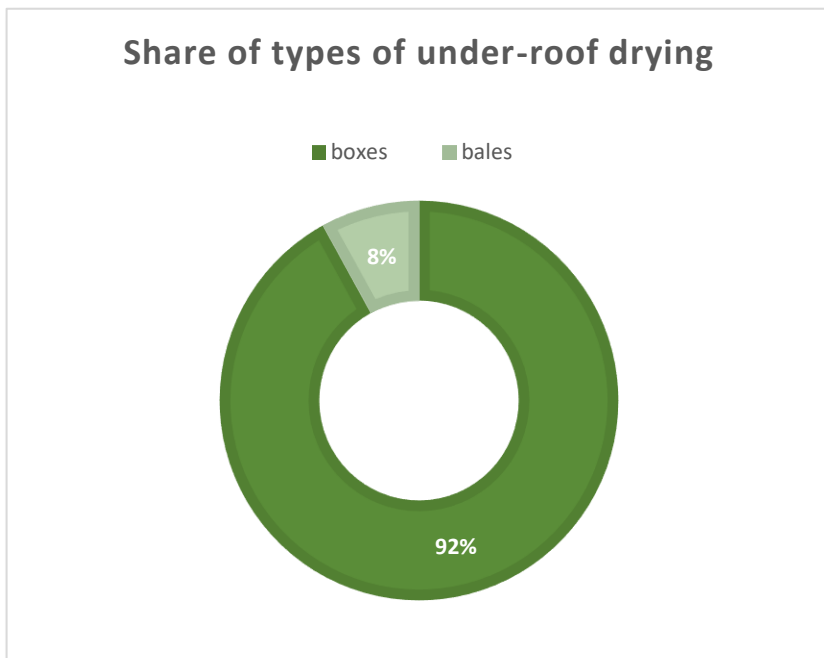


Figure 58  
Proportions of drying types for under-roof drying<sup>74</sup>

<sup>74</sup>Source: Kittl, Lindner, 2016; p. 67, own calculation

## Higher basic forage output through under-roof drying

Although under-roof drying systems require energy and incur costs, they are much more efficient than soil drying and pay off for the farms not only in terms of time, but above all economically. Better drying performance and the minimisation of crumble losses during harvesting lead to a higher basic forage yield.

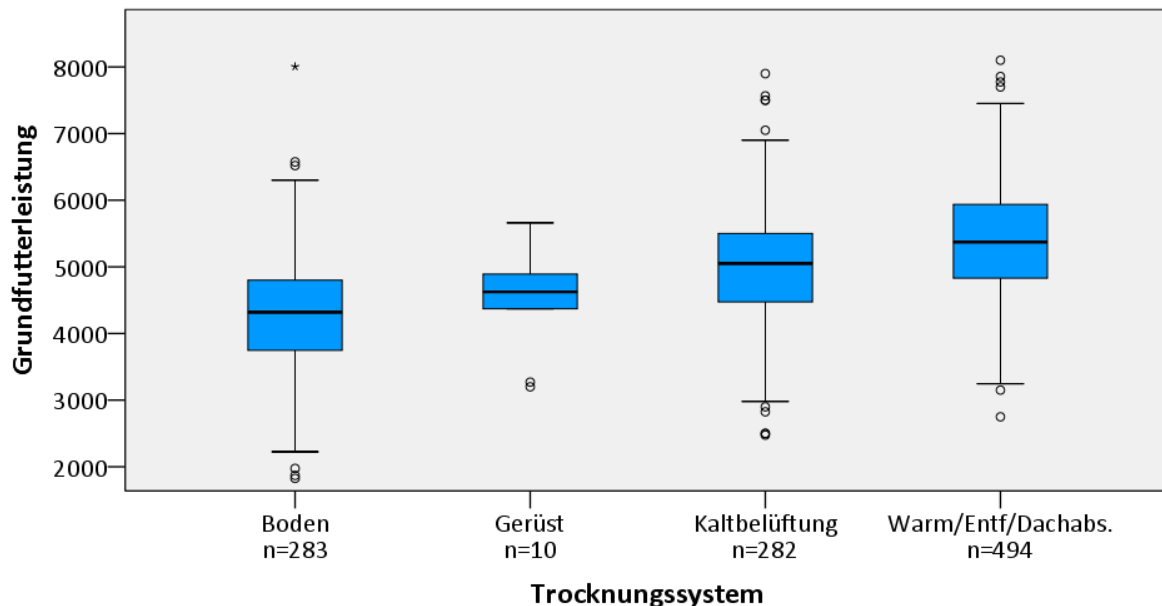


Figure 59

Basic feed performance according to drying system<sup>75</sup>

The basic feed yield per cow and year was calculated from the barn average (milk yield per cow and year), adjusted by the amount of concentrated feed per cow and year:

$$\text{Basic feed yield} = \text{Milk per cow} - (\text{concentrated feed} * 1,5)$$

This increased basic fodder yield has a positive effect on the profitability of hay-milk farms and contributes to the continuity of the farming method.

The hay-milk regulation of ARGE Heumilch stipulate that the proportion of basic fodder in the annual ration must be at least 75%, for organic hay-milk even 85%. In order to be able to guarantee this proportion, the hay-milk farms need particularly high-quality hay, which is guaranteed by the drying facilities. Furthermore, the small amount of concentrated feed used in addition to the hay must also be GMO-free and come from Europe.

The low proportion of concentrated feed also sets land that would otherwise be needed for the cultivation of feed grain free for human nutrition. This aspect also contributes to the ecological sustainability of the system.

<sup>75</sup> Kittl, Lindner, 2016; p. 118



### Energy sources for drying plants

An important contribution to the ecological sustainability of the system is the use of renewable energy for the drying facilities. Since hay drying falls in the sunny summer months and stables and hay storage facilities have large roof areas, photovoltaics are an ideal source of energy.

Just as the ground hay was dried by the sun in the past, the hay is dried today with the help of solar energy. The traditional way of farming is thus transferred into a contemporary form without changing its core.



*Figure 60*  
*The energy required for hay drying is often covered by photovoltaics.*

Ideally, the photovoltaic system is supported by a so-called roof suction system. The warm air that accumulates under the roof is sucked by the system and blown into the hay from below by a ventilator. In the process, the air cools down and then arrives again under the roof, where it is reheated by the ambient heat. On the one hand, this cycle makes ideal use of the heat, and on the other hand, it also increases the performance of the PV collectors because they are cooled and work more efficiently in a cool state.<sup>76</sup>

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<sup>76</sup> s. Obermaier, Sabine: Vollkostenrechnung der Erzeugung von Unterdachtrocknungsheu bei gleichzeitiger Kühlung der Photovoltaikmodule; TU München, 2013

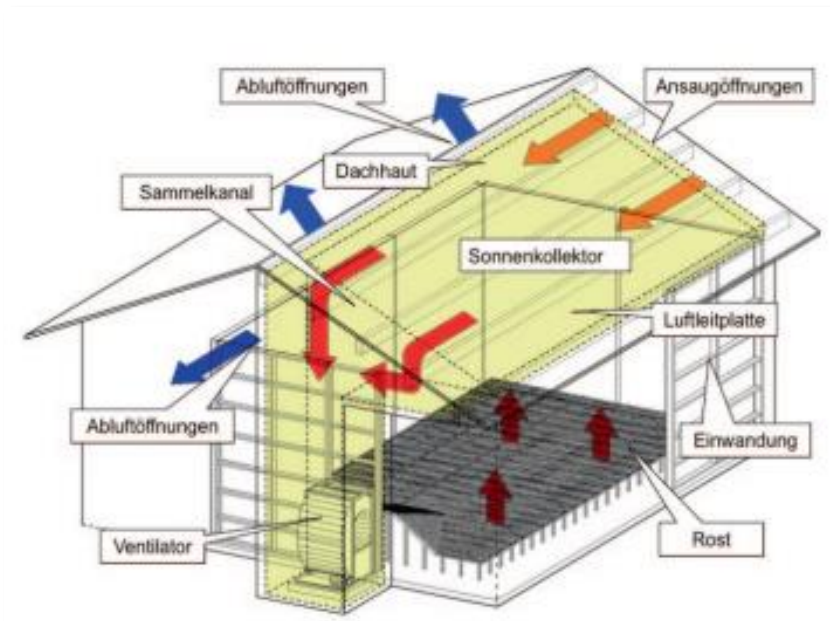


Figure 61  
Roof suction with PV system  
integrated in the roof<sup>77</sup>

One variant is drying with a dehumidifier. Here, the moisture is extracted from the air using the heat pump principle before it is blown through the hay. The systems (roof suction, dehumidifier) are sometimes also combined with each other.

### 3.3. Haymaking during the year

Winter feeding with hay is practised from about November to April. As soon as weather conditions permit, grazing begins in April.

The first mowing for hay preparation takes place from May, in higher altitudes also later. This is followed by further cuts spread over the summer. In favourable locations, mowing can be done about 4 times per summer, other areas are mowed only 2 - 3 times per summer.

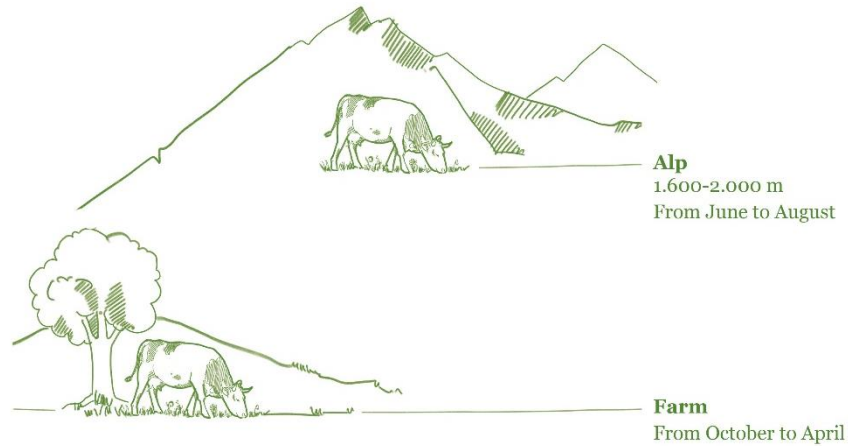
	January	February	March	April	May	June	July	August	September	October	November	December
Haymaking during the year												
Hay for winter feeding												
Soils are prepared												
Start of grazing season												
Pasture season												
"Almauftrieb" - cattle go to the alp												
Animals on the alpine pasture												
1. Mowing												
2., 3. and partly 4. Mowing												
"Almabtrieb" - cattle come back from the alp												
Last grazing days												

In the mountain area, alpine pasture farming is practised in parallel. Animals that are calved are driven to the alpine pastures from mid-May onwards. This varies according to the weather and the altitude of the mountain pasture. At higher alpine pastures there is often snow for longer, which can delay the

<sup>77</sup> Source: Agroscope Transfer 38/2014

drive. In particularly favourable conditions, it is also possible to drive up the alpine pastures as early as the beginning of May.

Likewise, the driving down of the alpine pastures in autumn can vary depending on the weather and often takes place earlier on particularly high-altitude alpine pastures than on lower-lying ones. Even after the summer grazing season, grazing often continues in the valley for some time, as long as the condition of the soil (wetness, frost) allows it.



### 3.4. Milk collection management

Milk collection is handled differently depending on local conditions. Due to the high number of processors, this results in short transport distances. In recent decades, it has become common practice to collect the milk directly from the farm or alpine pasture using milk collection trucks. For the most part this happens daily, occasionally every two days.



*Figure 62*  
The milk is collected directly from the farm by a milk collection truck every day or two. (Pictured: Zillertal, Tyrol)

Only in a few cases is the milk brought from the farm to the cheese dairy. There are still alpine dairies, mainly in Vorarlberg, but also in Tyrol. On these alpine dairies, the milk is processed into cheese directly on the alpine pasture.



Figure 63  
Cheese production at the alp

### 3.5. Traditional cheesemaking

In the hay milk regions, there are still many small Alpine dairies and cheese factories that practice traditional cheesemaking. The master cheesemakers pay particular attention to gentle processing of the milk. For example, many farms still process raw milk into cheese, or the milk is only thermised, i.e. heated very gently. This preserves the milk flavor better and the cheeses taste more pronounced and complex. To thicken the milk, traditional rennet from the calf's stomach is usually still used, which has very good protein coagulation properties. For cheese varieties such as Tyrolean or Vorarlberg mountain cheese and Austrian Emmental, this is a prerequisite for nurturing them to their flavorful peak during a long ripening period. These cheese specialties made from hay milk represent a distinctive cheese culture in the Austrian Alpine region.



Figure 64  
Production of Zillertal gray cheese in the Zillertal Alpine dairy

### Making natural hay milk into fine cheese specialties



Depending on the type of cheese, the milk is heated, on average to about 30°C.



Lactic acid cultures are added at the desired temperature, which convert the lactose into lactic acid.



Once the milk is sufficiently soured, rennet diluted with water is added. This initiates the process of thickening the milk.



After about 30 to 40 minutes, this is inspected to see whether the milk has thickened. A ladle is used to poke diagonally into the thickened mass, revealing the already liquid part - the whey.



When the thickening process is complete, cutting of the thickened milk into curd begins. Depending on the type of cheese, the curd is cut into walnut-sized to wheat-grain-sized pieces.



The whey is then separated and the curd is poured into moulds.



The cheese gets its compact shape in special presses.



After pressing, the cheese goes into the salt bath, which is used for rind formation and natural preservation. This also intensifies the taste.



The cheese is then carefully cared for in special ripening cellars until it has completed its ripening period. This can take three weeks, but also up to 24 months.

## 4. CULTURE, VALUE SYSTEM AND SOCIAL ORGANISATIONS

### 4.1. ARGE Heumilch Österreich

Since the beginning of the 21<sup>st</sup> century, hay-milk has been actively marketed. Since then, the share of hay-milk in the milk delivered in Austria has remained stable at 15%.

ARGE Heumilch was founded in 2004 and has been a registered association since 2009. All hay-milk farmers in Austria as well as 60 processing companies such as alpine dairies, cheese dairies and dairies in the region are united under the umbrella of ARGE. The most important goals are to preserve hay farming, to increase the added value for the farmers by decoupling them from the international milk markets and to offer products with high added value for the consumers.

To achieve these goals, ARGE Heumilch represents the interests of hay-milk producers and processors in politics. Among other things, it works to ensure that hay farming is maintained or expanded in the support measures of the ÖPUL programme.

However, the organisation's task is also to communicate the advantages of this sustainable hay farming on the market so that hay-milk farmers receive a fair producer milk price.

### 4.2. Hay milk regulation

Hay milk farmers and our processing plants produce according to the strict hay milk regulation, compliance with which is checked by independent, state-certified inspection bodies.

The regulation contains **provisions on feeding**, which stipulates that hay milk cows, goats and sheep are fed with fresh grasses, herbs and hay according to the species. Roughage such as green rapeseed, green corn, green rye or fodder beets may be fed in addition. Wheat, barley, oats, triticale, rye and corn in marketable form are allowed, as are field beans, forage peas, lupin, oilseeds and extraction meal. However, the roughage portion in the annual ration must be at least 75% of the dry matter, and 85% for organic hay milk.

All fermented feeds, as well as wet hay and fermented hay are completely prohibited. By-products of breweries, distilleries as well as other residues from the food industry are also prohibited. This also applies to feed of animal origin with the exception of milk and whey for young cattle.

All feed must originate from Europe and have been produced without the use of genetic engineering.

**Regulations on fertilisers** are also included in the hay milk regulation: for example, sewage sludge from municipal treatment plants must not be spread. Compost with green cuttings, shrub cuttings and organic waste is subject to special requirements, as is biogas slurry.

**Animal welfare provisions**, such as 120 days of outdoor exercise and/or pasture or Alpine grazing, are also important. Permanent tethering is prohibited under the hay milk regulation. A lying area must be available for each dam. Dehorning of calves is allowed only after effective anaesthesia, tail docking is prohibited.

### 4.3. EU quality label TSG - traditional speciality guaranteed

To be able to guarantee a uniform standard throughout Europe, ARGE Heumilch applied for EU protection label "TSG - Traditional Speciality Guaranteed" for hay milk. In 2016, the European Union awarded the seal of approval. As a result, only those products that meet these standards may be labeled as hay milk throughout Europe. Since 2019, sheep's hay milk and goat's hay milk may also carry the EU protection label TSG - traditional speciality guaranteed.



It should be noted at this point that the EU quality label is a minimum standard that applies uniformly throughout Europe. The hay milk regulation standard is much stricter, requiring, for example, no silage on the whole farm and setting animal welfare standards that are not included in EU protection.

### 4.4. Identity, sense of place, customs

Thanks to the activities of ARGE Heumilch, hay milk has been established on the market as a separate type of milk, which has made it possible to pay higher milk producer prices and enable hay milk farms to survive economically.

A survey of hay milk farmers revealed that, in addition to raising awareness of the hay milk product and the higher prices, the strengthening of their own identity as hay milk producers in particular is perceived as an advantage resulting from the work of ARGE Heumilch. While hay milk farmers were considered retrograde just a few decades ago, they are now pioneers of sustainable agriculture.

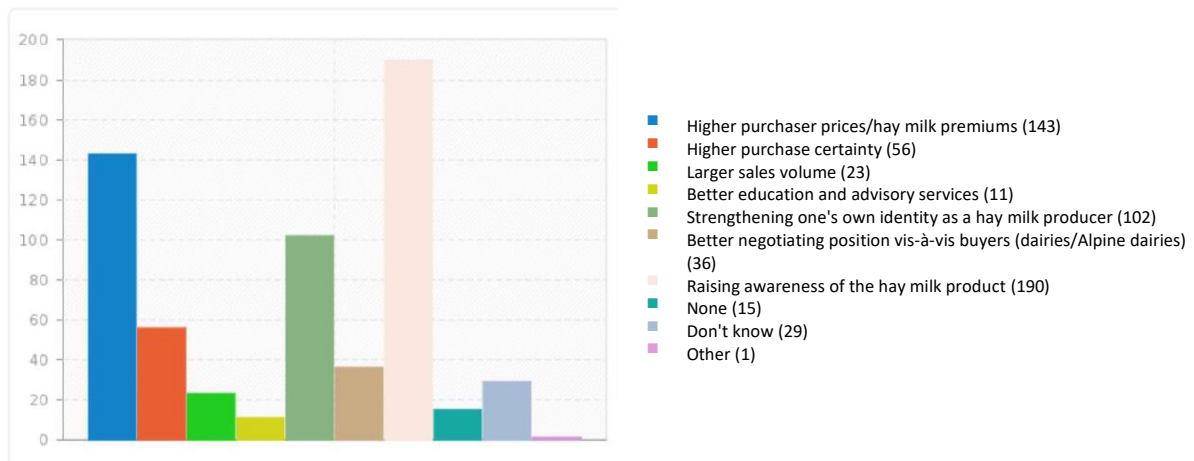


Figure 65  
Benefits through ARGE Heumilch, survey of farmers, Zollitsch, p. 65

Due to the small-scale farms, hay milk farmers have a special connection to their land and their dairy animals. Even though both are fundamental for the economic survival of farms, they are less perceived as operating resources.

### 4.5. Departure to and return from Alpine pasture

Historically, hay farming has been associated with many rituals and traditions, most of which have been forgotten and/or have become obsolete due to changing conditions. Mowing and haymaking



were historically associated with many rituals that were lost from collective memory with the professions of farmhand and maid.

The tradition of departure to and from Alpine pasture has been preserved in many regions. The departure to Alpine pasture is celebrated less, even though animals and farmers often long for it at least as much as the return in the autumn. Even today, the dairy animals are often taken on foot to the mountain pastures, where they spend the summer.

### **Return from Alpine pasture**

The return from Alpine pasture is still celebrated as a festival in many places today. This has its origins in the fact that after the work was done, the Alpine pasture staff received their wages when they returned from the Alpine pasture. However, they also wanted to celebrate an accident-free or at least accident-free summer on the mountain pasture after all their toil and trouble.



*Figure 66  
Homecoming of the animals  
in the Stanzer Valley<sup>78</sup>*

A headdress is made for the animals from the last flowers days before the return from Alpine pasture. The form of the headdress varies from region to region and ranges from eye-catching, tall arrangements to simple flower wreaths. The return from Alpine pasture also includes the ringing of large bells that the animals wear around their necks. They announce the return of the dairy cattle in the valley from afar.

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<sup>78</sup> Wopfner, p. 436



Figure 67  
Return from Alpine pasture,  
[www.heumilch.at](http://www.heumilch.at)

In the valley, the procession of cows is already expected. The farmers take the cows back into their care and this is often combined with a celebration on the farm. Today, the return from Alpine pasture is a spectacle not only for locals, but also for tourists and contributes to the cheerful and original image of the Alpine region.

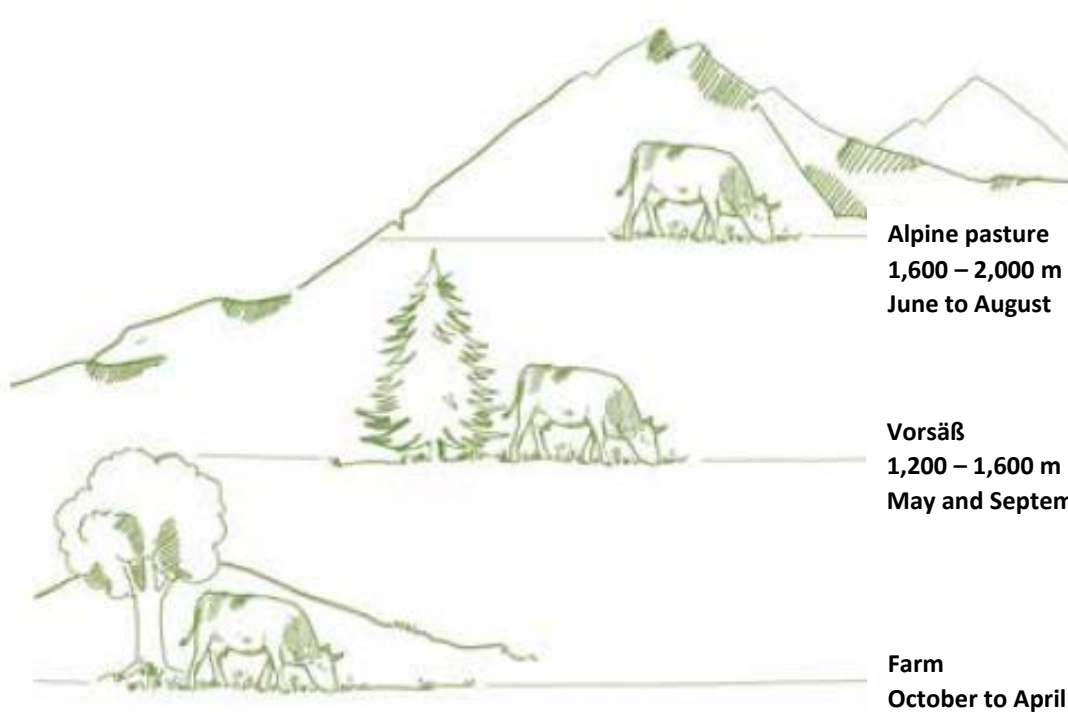


Figure 68  
To celebrate the Alpine summer,  
the cattle are decorated for their  
return journey.

#### 4.6. Three-stage agriculture

In order to be able to use the alpine pastures optimally, so-called three-stage farming is practised in some areas: Here, the families first move with their animals from the farm to a low-lying alpine pasture - the so-called Vorsäß or Niederleger at about 1,200 to 1,600 metres. In July, they move on to the Alpe or Hochleger, which is between 1,600 and 2,000 metres. There they spend the summer, before returning to the Vorsäß and then to the valley in September. This mobility between three altitudes allows the animals to be fed with fresh grass and hay all year round.

In the Bregenzerwald, traditional three-stage farming is even considered an intangible UNESCO World Heritage Site.



3

As soon as climatic conditions allow, the animals are taken to the alpine pasture at about 1,600 - 2,000 metres.

Here in the alpine level they spend the warmest months grazing. This level is not forested and offers a high diversity of species as fodder.

2

In spring, the animals are moved to a higher area - "Vorsäß" - at about 1,200 - 1,600 metres. The montan stage is forested, but historically has glades created by cultivation and clearing, which are used as intermediate pasture.

1

The hay-milk farms are located at approx. 500 - max. 1,200 metres above sea level in the valleys and along the colline level. They are surrounded by permanent grassland. Here the animals graze in autumn and spring. In summer, the hay for the winter is harvested here.

#### 4.7. Customs

Some elements of agriculture and Alpine farming have found their way into the regions' customs. The bells that the animals wear on the mountain pasture so that they can be found play a role in various traditions. This is the case with the beating of bells, for example, which is a tradition in many Tyrolean towns during Fasnacht - the time before Lent. Men tie the largest bells around their waists and move rhythmically through the village, so that the winter is driven out by the loud ringing.

This is similar to grass awakening, which is usually done by the boys. They parade through the village with bells in mid to late April to "wake up" the grass to usher in spring.

#### 4.8. Costume

The traditional Alpine costume is also characterised by the farming communities of centuries past. The word "costume" simply means "what is worn" and so the traditional costume is based on the everyday clothing of the farming community. After all, in the period when the costume existed as special regional clothing at the beginning of the 19th century, farm life was considered to be pure and original. The clothing worn by farmhands and maids on the farms was therefore stylised and standardised, entering folk culture as traditional costumes. This process took place mainly from the Napoleonic wars onwards.



Figure 69  
Traditional costume<sup>79</sup>

Even though traditional costumes in the Alpine region can differ greatly from region to region, they all have their rural origins in common. It should be noted that what we understand today as a traditional costume is based on the festive clothing of the farming population. However, wearing the traditional costume is always an expression of a certain lifestyle that appreciates country life. While the costumes lost a great deal of their importance in the second half of the 20th century, they have been experiencing a real renaissance again since the turn of the millennium. The paradigm shift towards regionality and originality, which has already been mentioned several times, certainly plays a major role here.

The leather trousers, for example, can be considered especially exemplary for the traditional costumes in general. Since leather as a material is particularly durable, it had already been commonly used for trousers for centuries. While the bourgeois population in the city preferred long trousers from around

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<sup>79</sup> Source: <https://www.uibk.ac.at/de/newsroom/2017/auf-tuchfuehlung/>

the French Revolution, the farmers in the countryside wore short leather trousers, which eventually entered popular culture as Lederhosen.



Figure 70  
Leather trousers are part of the traditional costume in the Alpine region. (Photo: © TMN/Spiegel.de)

Traditional costume associations exist throughout the Alpine Arc that work to preserve the traditional costume and customs. Traditional costumes and customs are also of great importance for tourism, as they are typical of the Alpine region along with the landscape and support the image of the region. This is evidenced, for example, in "Tyrolean evenings", where traditional dances and costumes are demonstrated, especially for guests. Since traditional costumes vary greatly from region to region, differing from valley to valley in the Alpine region, for example, they also contribute to the identity of the regions and the identification of the rural population.

#### 4.9. Traditional recipes

In the course of hay farming, recipes have developed regionally that showcase the products of the farms and Alpine pastures. Under the conditions provided by the simple cooking stoves, as well as with the meager yields of their own agriculture, tasty dishes were created. Many of the formerly poor people's dishes are now part of regional food culture.

Here are some examples:

- **Melchermuas**  
A type of pancake cooked using just butter, flour and milk, which is baked in an iron pan until golden brown. Served with cranberries, this classic is especially well known and popular in Zillertal.
- **Schliachternudeln**  
Ribbon noodles served with a hearty sauce of gray cheese, Tilsiter and cream.
- **Zerggln**  
Potato patties, curd cheese and gray cheese.



- **Kässpätzle**

... auch Käsknöpfle genannt. Weiße Spätzle aus Milch, Mehl und Eiern werden mit Käse gemischt und im Ofen überbacken.



- **Zillertaler Krapfen**

Crepes with a filling of potatoes and cheese are baked floating in fat.



- **Millisuppn**

Spiced milk is heated and enjoyed with rye bread cubes as a soup.



- **Käsfladen**

Eine Art Tarte mit Germteig und einer Mischung aus Käse, Zwiebeln, Mehl und Ei gefüllt.



- **Kaspressknödel**

The epitome of Alpine cuisine today. Flat dumplings made of bread cubes, eggs, onion and cheese, roasted until golden brown and served in soup or with salad.



- **Breznsuppe**

With this dish, old pretzel and bread leftovers processed into pretzel pieces soaked in soup are baked with cheese and onion.



## 5. FEATURES OF THE LANDSCAPE

### 5.1. Soil

The parent material in the region is mainly alluvial and moraine material, as well as colluvial material in the foothills of the Alps. The humus content is medium humus to strong humus with predominantly finished humus as the humus form.

The soil can be classified mainly as brown earth. Occasionally, Gleysols are also found, as well as mountain black earth and Eurusina in the mountainous regions.

### 5.2. Climate

The hay milk region is characterised by the Alpine climate, which features warm summers as well as radiation weather (high-pressure weather with little cloud cover) and cold-air pools in winter. Precipitation is evenly distributed throughout the year and falls as snow in winter.

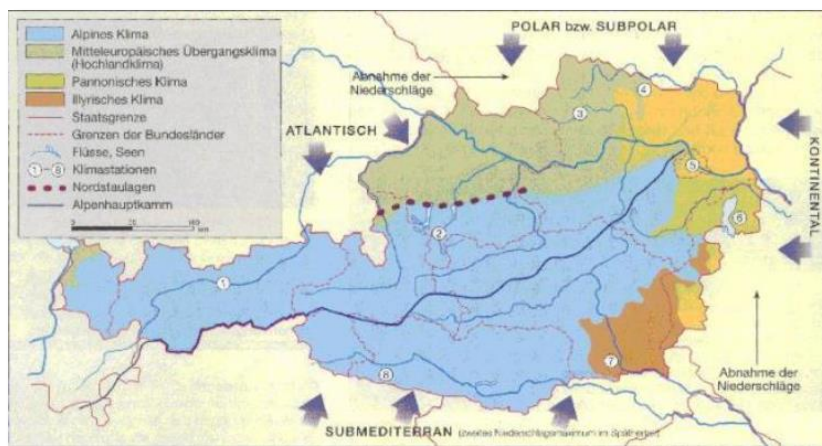


Figure 71  
Climate provinces in Austria<sup>80</sup>

There are 4 seasons with pronounced temperature differences between summer and winter. There is sufficient precipitation and, in the summer, sufficient periods of good weather for hay farming.

#### Spring

January is the coldest month, while from mid-February temperatures start to rise again and become relatively mild as early as March and April. As early as April, 15 to 20°C are often reached.

#### Summer

Summers in Austria are mild to hot. In June, temperatures of 20 to 25°C are recorded, while in July, the hottest month, more and more tropical days are recorded at 30 to 35°C. From August, the temperatures are milder again.

<sup>80</sup> Source: <https://www.yaclass.at/p/geografie-und-wirtschaftskunde/11-schulstufe/oesterreich-raum-gesellschaft-wirtschaft-19273/naturraeumliche-chancen-und-risiken-19089/re-23f1fdc4-b3a6-4806-9742-cd4136336650>

## Autumn

Autumn often turns out to be very stable, especially in mountainous regions. Until October, mild temperatures of up to 20°C are often recorded. From November, temperatures drop noticeably.

## Winter

Winters are cold with temperatures below 10°C, often at or below freezing. In addition, snow often falls in winter, sometimes in large quantities.

Climate change is already making itself felt through rising temperatures and falling precipitation. In years with particularly low precipitation, such as 2018, agriculture comes under increasing pressure.

### **5.3. Cultural landscape**

Dairy farming, which has been cultivated and developed over centuries in the Austrian Alpine arc as hay farming, has created a characteristic cultural landscape. This characterises the region and makes a decisive contribution to its success as a tourist region.



*Figure 72  
Haymaking keeps natural areas open and thus also contributes to the success of the region as a tourist destination.*

The characteristic picture of the mountain region is characterised by more or less narrow valleys in which the settlement areas are densely populated. Around the settlement areas, in the colline stage, are the grassland areas where the dairy animals graze or the grass is harvested as fodder. Since the last ice age, these areas were often forested with deciduous forest/floodplain forest and were only gradually cleared by the (agricultural) use of the ancestors.<sup>81</sup>

From about 800-1000 metres above sea level, the montane stage begins, which is still forested today. Here, coniferous forest predominates, which in the region is very spruce-emphasised. The forest is extensively managed in the region and, among others, maintained by hay-milk farmers. Non-forested areas in this stage are mainly areas where avalanches or mudflows frequently occur.

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<sup>81</sup> Bätzing, 2015; S. 41f



At an altitude of 2000 metres above sea level, the upper timberline is located and the alpine stage begins. How high the timberline is depends on the respective topography. In the Alpine arc, it is about 2000 metres and above in the inner Alps, and about 1800 metres at the edge of the Alpine arc. At this altitude, trees can no longer grow for climatic reasons. The temperatures are too cold and the vegetation period is too short, so that the seeds of the trees cannot mature. Therefore, the forest here is replaced by alpine mats. The upper tree line was successively lowered by grazing and slash-and-burn at the beginning of settlement. Alpine researcher Werner Bätzing estimates that the tree line was lowered by about 300 metres throughout the Alps.<sup>82</sup>

There have always been primeval meadows here, which have been used as alpine pastures since the Bronze Age<sup>83</sup>. These have developed into the alpine pastures that are still characteristic of the hay-milk region today. In this zone, pasture is the only possible agricultural use. Arable farming would not be possible due to the climatic conditions and the vegetation is also too sparse for hay making.

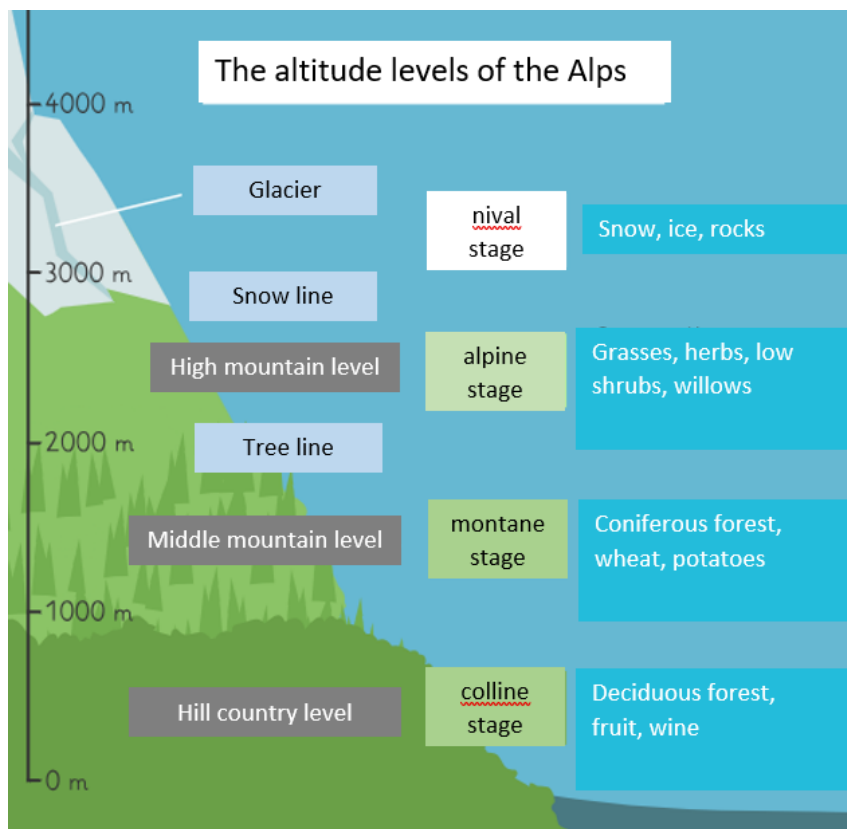


Figure 73  
Altitude levels of the Alps<sup>84</sup>

### Importance of the forest in the cultural landscape of the hay-milk region

The forest is also inextricably linked to this cultural landscape. The areas that are used for haymaking today were originally mostly forests and were cleared by the ancestors to make them suitable for agriculture. This applies both to the areas in the valley, where there were originally riparian forests, and to the areas in the alpine region.

<sup>82</sup> Bätzing, 2015; p. 88ff

<sup>83</sup> <https://de.wikipedia.org/wiki/Urwiese>

<sup>84</sup> Source: <https://www.sofatutor.com/scahununterricht/videos/die-alpen#die-hoehenstufen-der-alpen>

How closely the forest is linked to the way of farming becomes visible wherever areas are no longer cultivated. Within a few years, these areas become overgrown, only to revert to forest within a few decades. Haymaking keeps open precisely those areas that are too unprofitable for other farming methods (especially alpine pastures).

The forests in the region are mostly coniferous forests with a dominance of spruce, which is replaced by pine at higher altitudes. However, as spruce is not very drought-resistant, there are already efforts to bring more diversity into the forests in order to prepare them for climate change.

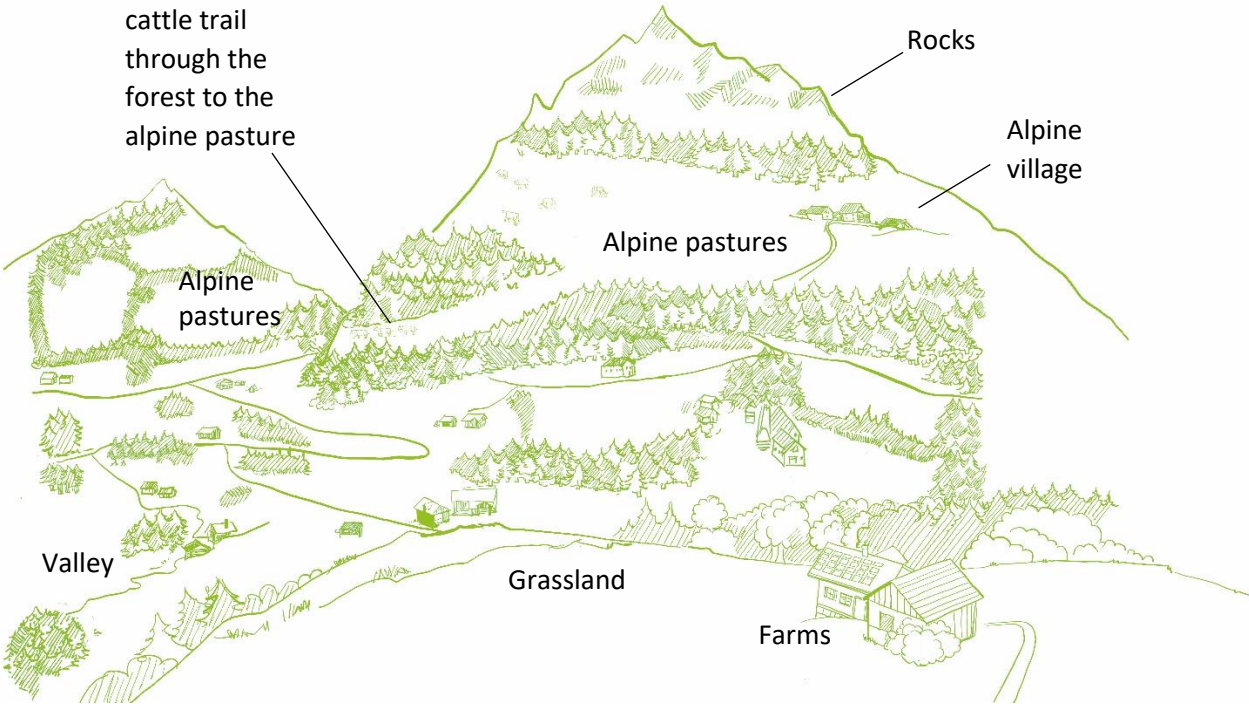


Figure 74  
The forest plays an important role in the system between permanent grassland in the valley and alpine pasture at altitude.



Figure 75  
Forest and permanent grassland complement each other in the region. (The photo was taken during the field visit in August 2023).

In mountain regions, the forest not only fulfils the function of carbon and water storage, but also protects against avalanches and mudslides.

The ownership of the forests in the region varies - similar to the alpine pastures. A large part of the forest is in public hands (Austrian Federal Forests, municipalities). However, a considerable part is also in private hands. This has been inherited over the centuries and is partly divided into very small parcels. Regardless of the individual ownership structure, the forest is in any case directly or indirectly linked to the way it is managed.

In the region, there is an interaction between forests and pastures, which "compete" for the same soil in some parts of the system. The landscape cannot decouple grassland, pasture and forests as they are part of the same landscape and ecosystem picture. Where grassland and pasture are abandoned, forests take their place. The overall picture is the result of a historical dialogue between humans and nature.

The wood harvested from the forests is often important for the hay industry and the region:

- Firewood for cheese boilers on the alpine dairies
- Wood chips for cheese dairies, hay drying plants and heating of farms.
- Wood is also an important building material for the houses, stables and barns.
- Wooden boards (mainly spruce) play a major role as shelves in the cheese maturing process<sup>85</sup>

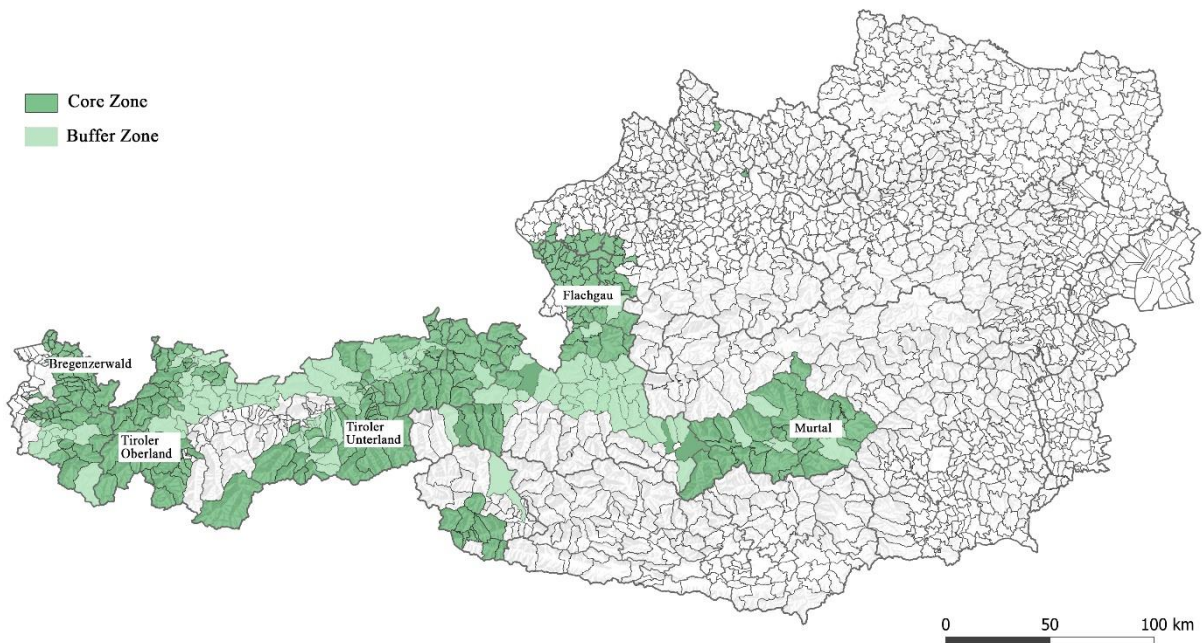


Figure 76

The wood harvested in the forest has many functions in the haymaking system and in the region.

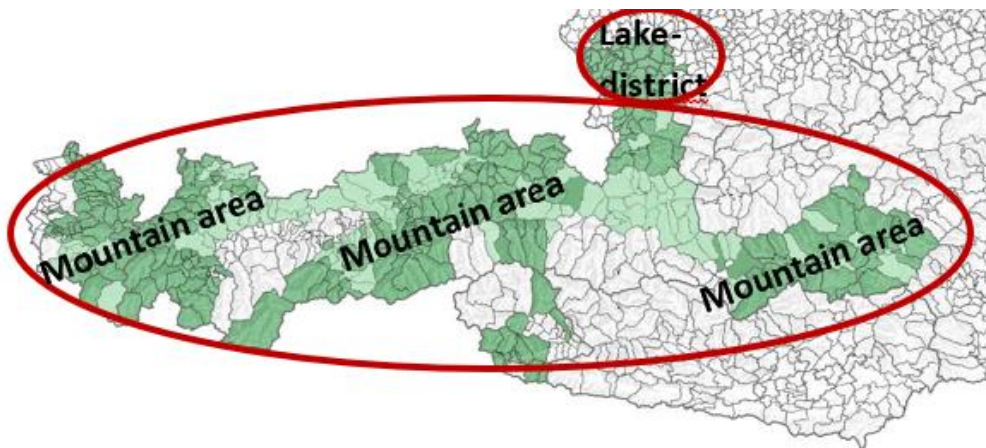
<sup>85</sup> see IDF Germany, Faktencheck „Verwendung von Holz bei der Käsebereitung“: [https://idf-germany.com/wp-content/uploads/2018/02/2016.11\\_IDF-Faktencheck-Verwendung-von-Holz-in-der-K%C3%A4sereifung.pdf](https://idf-germany.com/wp-content/uploads/2018/02/2016.11_IDF-Faktencheck-Verwendung-von-Holz-in-der-K%C3%A4sereifung.pdf)

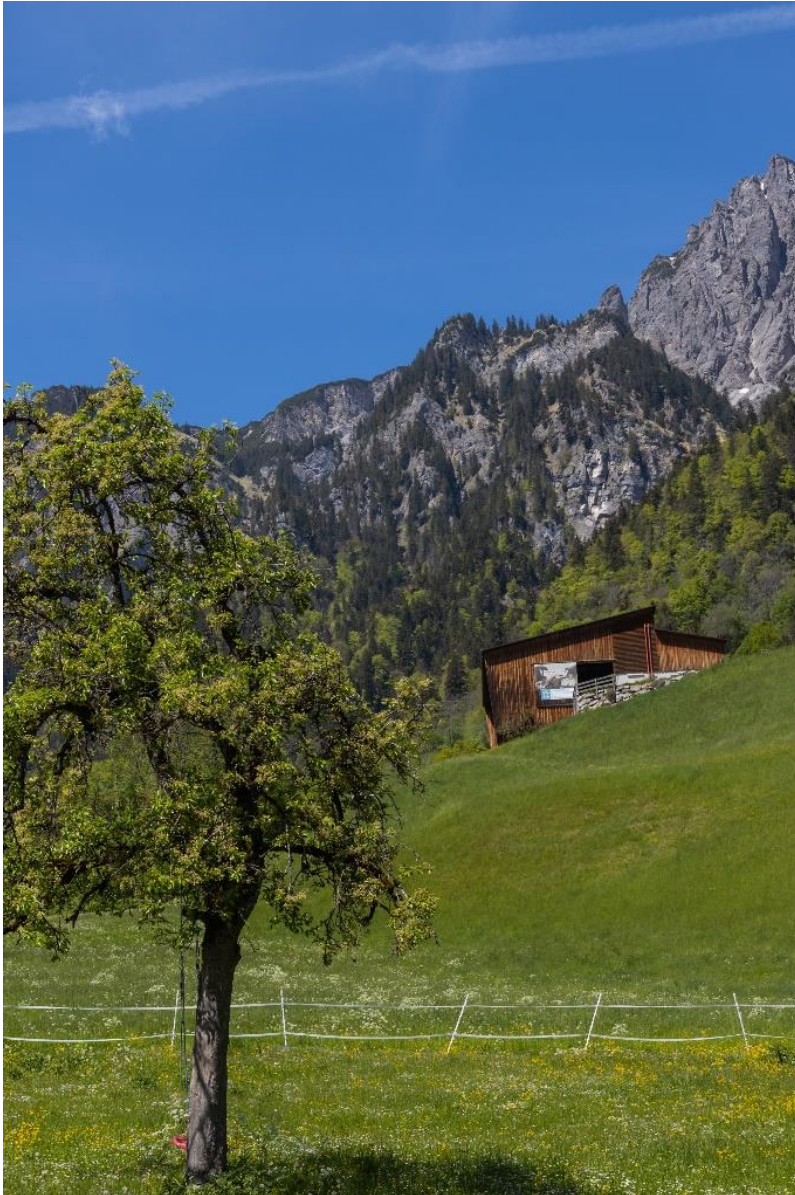
## 5.4. Overview of the region



The core areas are distinct hay-milk areas. In the buffer zones, hay farming is also practised, but there is also silage farming. It is not possible to quantify exactly how high the shares are in each case.

The region is characterised by mountainous, alpine landscapes in the west and east and by the Alpine foothills in the north (Flachgau), where rolling hills and lakes dominate the landscape.





*Figure 77*

*In the mountain areas, the flat areas in the valley locations are limited.*



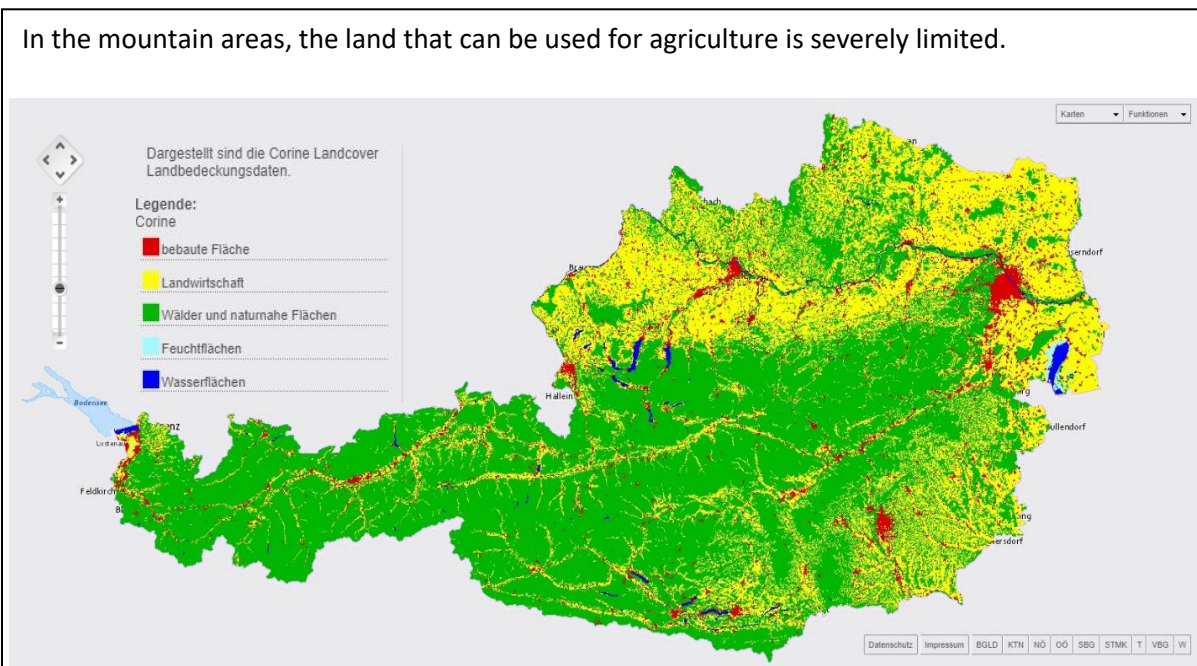
*Figure 78*

*Therefore, some of the animals are sent to the alpine pastures in the summer.*

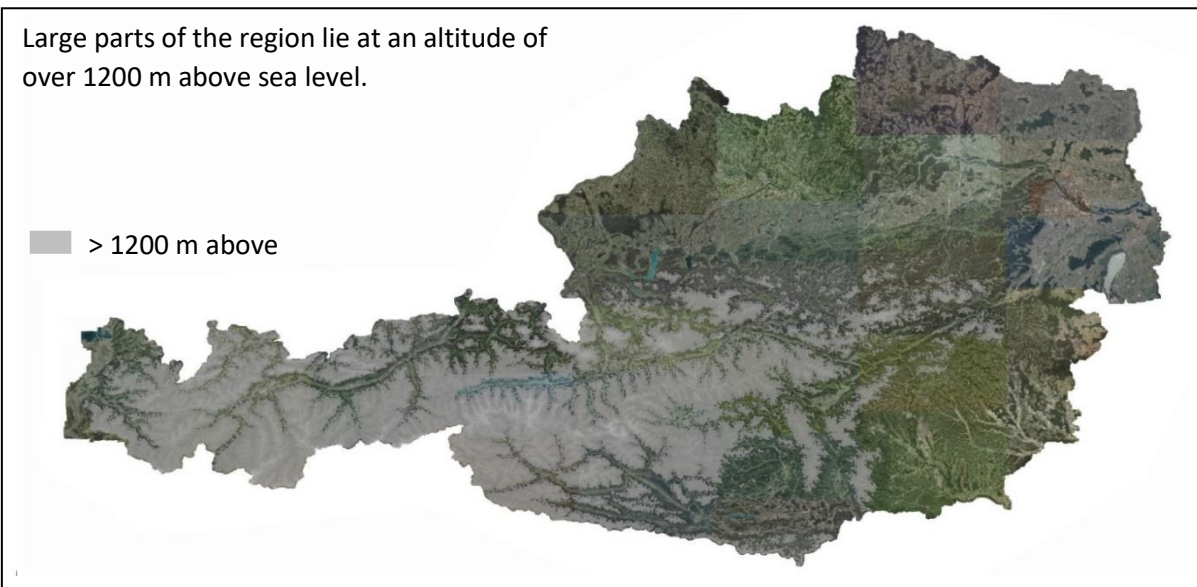


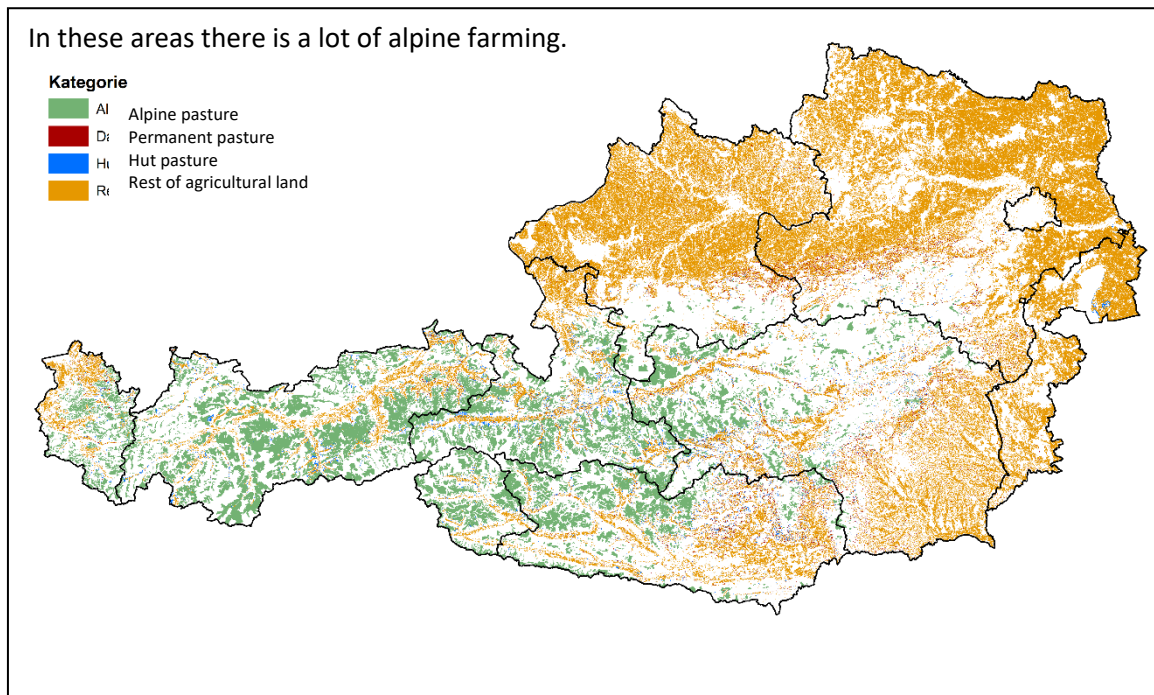
Figure 79  
In the favourable locations in the lake district, gentle hills and lakes dominate the landscape.

In the mountain areas, the land that can be used for agriculture is severely limited.



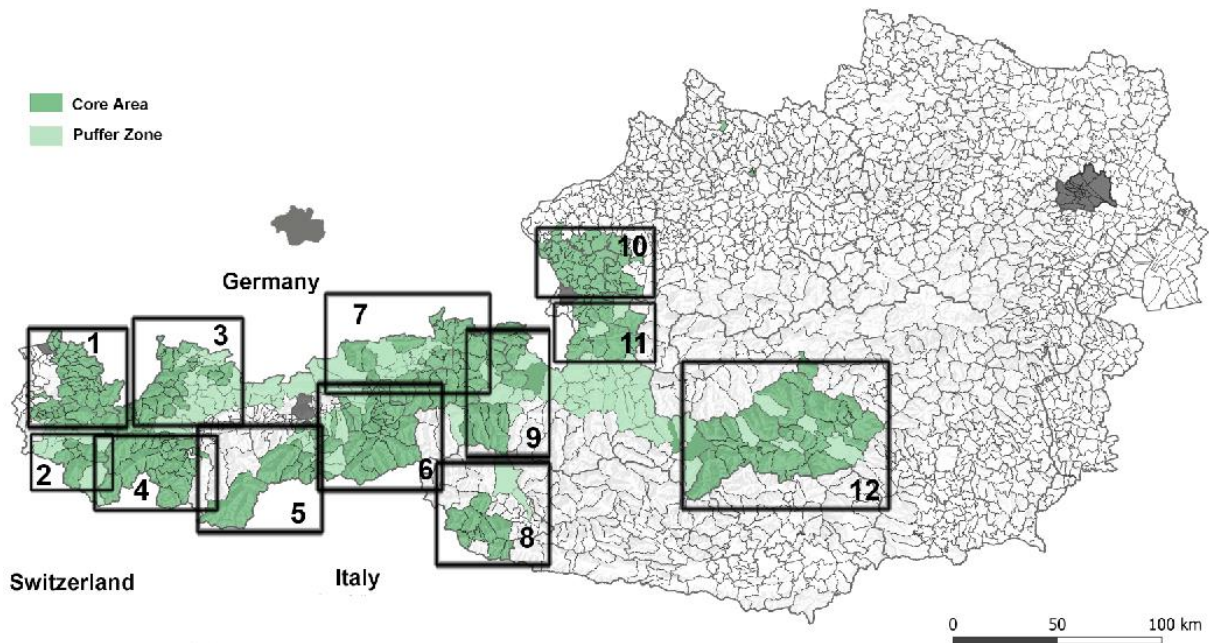
Large parts of the region lie at an altitude of over 1200 m above sea level.





## The individual hay-milk areas

The proposed GIAHS region is spread over various valleys in the Austrian Alpine arc as well as the lake area in Salzburg's Flachgau region. In order to better represent the valleys, they were divided into individual detailed maps.



- 1 Bregenzerwald / Großes and Kleines Walsertal
- 2 Montafon
- 3 Außerfern
- 4 Tiroler Oberland
- 5 Wipptal and Stubaital
- 6 Zillertal – Gerlos
- 7 Kitzbühel Alps – Kaisergebirge
- 8 Osttirol
- 9 Western Pinzgau and Loferer Steinberge
- 10 Flachgau and Mondseeland
- 11 Tennengau
- 12 Murau and Murtal

## Basic information about the maps

The detailed maps below are taken from the Corine Landcover Map of the Federal Ministry of Agriculture, Forestry, Regions and Water Management. These land use maps of the region show not only the areas directly connected with haymaking but also those areas that are only indirectly (forest, mountain railways) or not at all (industry and commerce) connected with haymaking. These land use maps show not only the areas directly connected with haymaking but also those areas that are only indirectly (forest, mountain railways) or not at all (industry and commerce) connected with haymaking.

### ■ Settlement areas (excluded)

Settlement areas are more or less densely built-up areas and are mostly located in the valleys. They are to be excluded from the region.



#### ■ Leisure facilities (excluded)

The recreational facilities are mountain railroads and their associated areas, which serve as ski resorts in winter and are lifts for hikers and recreationists in summer. These are indirectly linked to the haymaking industry, as they live off the cultural landscape that produced them. In part, the ski slopes are also used as pastures in summer, which ensures the existence of the areas and protects the emergence of so-called Blaiken (see Chapter IV. 2).

#### ■ Industrial, commercial und traffic areas (excluded)

Of course, there are industrial, commercial, and transportation sites in the region. These are to be excluded from the GIAHS region unless they are the processing operations of the hay industry.

#### ■ Heterogeneous agricultural land (natural vegetation)

The small proportion of heterogeneous agricultural land is indirectly related to hay farming. It is mostly natural vegetation on areas that cannot be farmed, such as reed beds around lakes.

#### ■ Grassland

Grassland is the core of haymaking. Here grass is harvested in summer and hay is prepared, which serves as fodder in winter, or from spring to autumn the grassland is also grazed. These areas also give the region its typical appearance.

#### ■ Farmland

The mountainous regions of the hay-milk region are not suitable for arable land, which is why there is no arable land in the region, with very few exceptions. Only in Flachgau is there a little arable land, but this belongs to the region because hay-milk farmers grow field fodder here.

## ■ Forest

The forest in the region is directly linked to haymaking. The areas that are used for haymaking today were originally mostly forests and were cleared by the ancestors to make them suitable for agriculture. This applies both to the areas in the valley, where there were originally riparian forests, and to the areas in the alpine region.

How closely the forest is linked to the way it is farmed becomes visible wherever areas are no longer farmed. Within a few years, these areas become overgrown, only to become forest again within a few decades. Haymaking keeps open precisely those areas that are too unprofitable for other farming methods (especially alpine pastures).

The forests in the region are mostly coniferous forests with a dominance of spruce, which is replaced by pine at higher altitudes. However, as spruce is not very drought-resistant, there are already efforts to bring more diversity into the forests in order to prepare them for climate change.

In mountain regions, the forest not only fulfils the function of a carbon and water reservoir, but also protects against avalanches and mudslides.

For more information on the functions of the forest, but also on ownership, see chapter "Importance of the forest in the cultural landscape of the hay-milk region".

## ■ Alpine mats - alpine pasture

The natural grassland or the alpine meadows belong as alpine pastures quite integrally to haymaking. These areas can only be made usable by means of alpine pasture management. The ownership conditions are different. In addition to private alpine pastures, they can also be owned by municipalities or agricultural communities. (see section on alpine pasture management and grazing in the answers to the SAG meeting).

## 1 Bregenzerwald / Großes und Kleines Walsertal

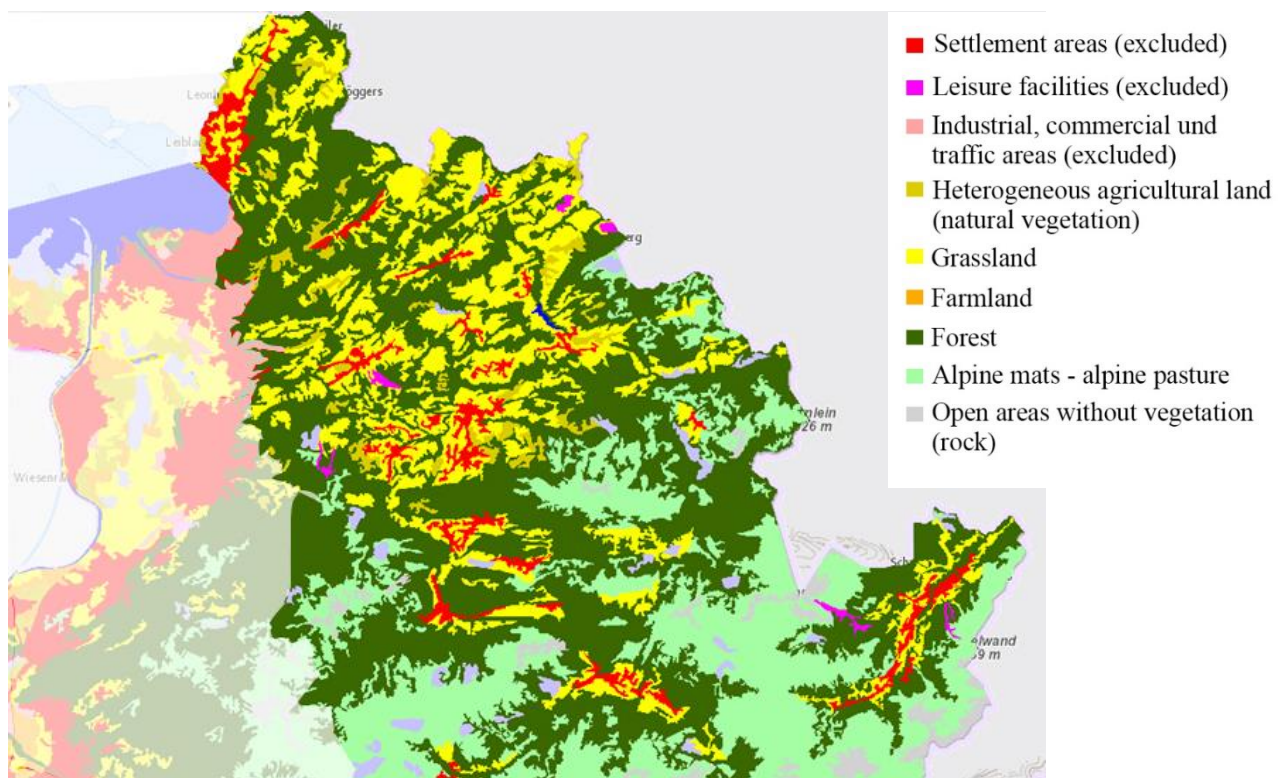


Figure 80  
Bregenzerwald

Starting in the far west of Austria, the Bregenzerwald and the Great and Small Walsertal offer a typical alpine landscape with mountains up to 2100 metres high. The villages in the valleys are densely populated. Around the settlements there is natural vegetation in addition to permanent grassland.

Three-stage farming is practised here (see Chapter IV. 4.6). In spring, the pastured cattle are driven up to the forelocks and in summer to the high alpine pastures. In autumn they return to the valley in stages. Between the steps of the alpine pastures lies the forest, which gives the region its name and is inseparably linked to haymaking.

Besides haymaking, tourism is a main source of income in the Bregenzerwald. This is directly linked to the landscape that was created by hay farming. In addition, there is also a lively craft culture as well as its own architectural scene, which works primarily with the material wood, which is available in abundance in the region. The traditional building style is interpreted in a modern way and gives the region its own character. In this way, the landscape is used sustainably - the meadows and pastures for haymaking and the forest for crafts and construction.

Excluded are those areas that are designated as "artificially created areas not used for agriculture". These are ski areas that belong to tourism and are therefore only indirectly linked to haymaking.

### Neighboring

In the west, the Bregenzerwald borders on the Rhine Valley. This is a settlement area that is one of the most densely populated in Europe. The provincial capital Bregenz gives the Bregenzerwald its name, but it does not belong to it and lies here in the Rhine Valley.

The Klostersal borders on the south. Here the conditions for agriculture are similar, but silo farming is also practised here, which is why this valley does not belong to the region.

## 2 Montafon

- Settlement areas (excluded)
- Leisure facilities (excluded)
- Industrial, commercial und traffic areas (excluded)
- Heterogeneous agricultural land (natural vegetation)
- Grassland
- Farmland
- Forest
- Alpine mats - alpine pasture
- Open areas without vegetation (rock)

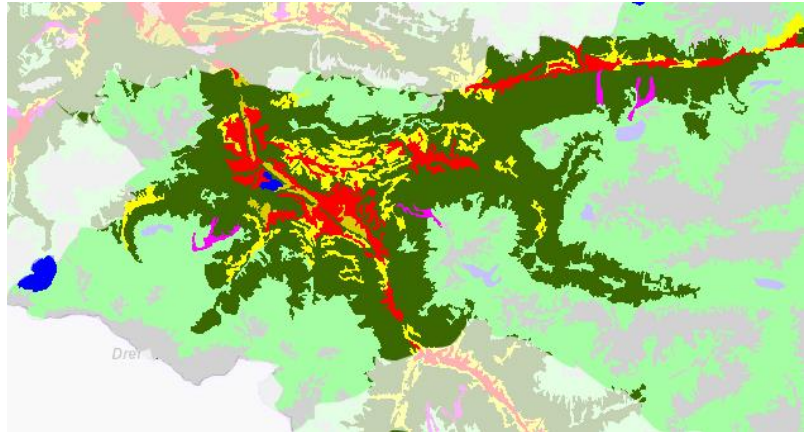


Figure 81  
Montafon

In the south of the province of Vorarlberg lies the Montafon, which is also a classic hay-milk region. Here the mountains are higher than in the Bregenzerwald with up to 3,300 metres. The landscape is similar to the Bregenzerwald and equally characterised by dense settlement areas in the valley basins surrounded by permanent grassland (yellow), which is replaced by forest and finally extensive alpine pastures at higher altitudes.

In addition to the settlement areas (red), the mountain railways (pink) are also excluded here.

### Neighbouring

To the north, the Montafon borders on the Klostersal, which is a mixed area between hay and silage farming. To the east, Montafon borders on the hay-milk areas of Stanzertal and Paznaun, which belong to the province of Tyrol. In the south, the Montafon borders on Switzerland.

### 3 Außerfern

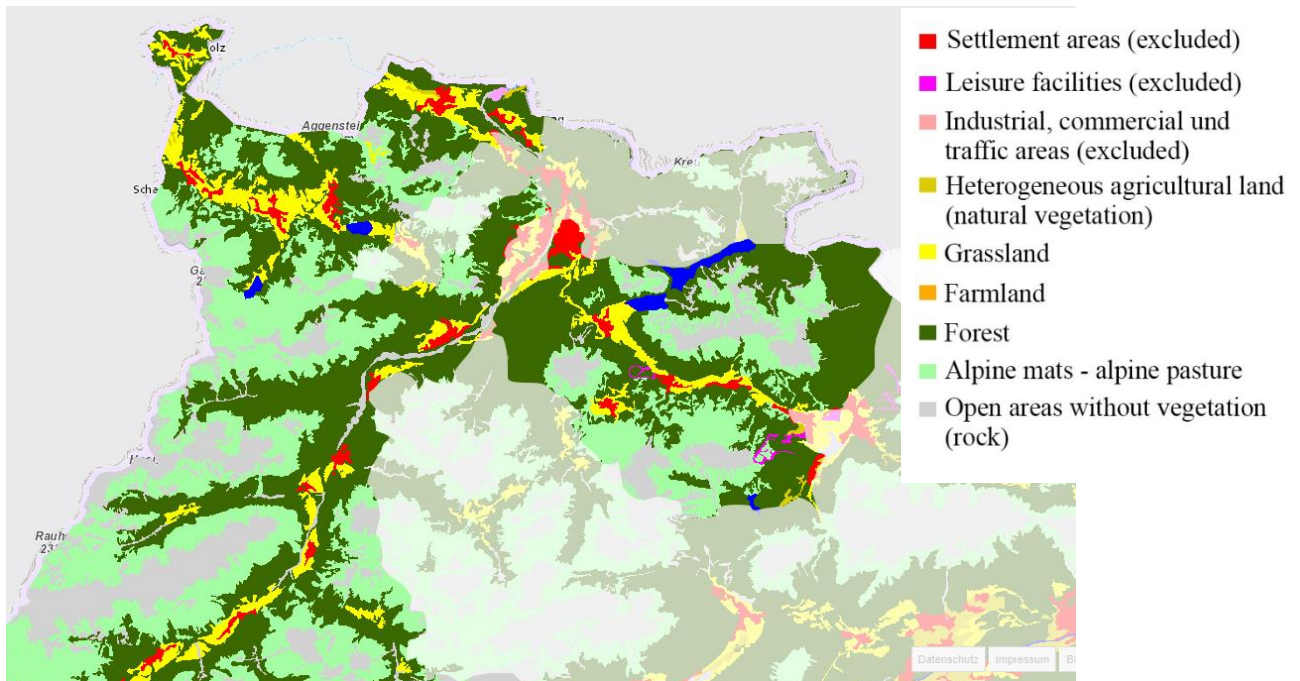


Figure 82  
Außerfern

The Außerfern with Tannheim Valley and Lech Valley is dominated by high mountains with an altitude of up to 3000 metres. Reutte, the largest town in the Außerfern, is characterised by a leading industrial enterprise (Plansee) and is not part of the hay-milk region.

The hay-milk region includes the valleys of Tannheim valley and Lech valley, which have a distinct hay-milk characteristic. The valley called Zwischentoren to the south-east of Reutte also belongs to the region, even though tourism plays an even greater role here than in the other two valleys, as Zwischentoren has always been and still is an important travel route from the Allgäu in Germany to the Inn valley. All three valleys have densely populated villages on the valley floor, with permanent grassland of hay-milk farmers on their edges.

The Lech valley is home to one of the last riparian forests in the region, as they were found on almost all rivers until the Bronze Age. Today, this is a protected area, but it still belongs to the region, as haymaking and even forest grazing are practised here as well.

At higher altitudes, as in other valleys, coniferous forests can be found in the Außerfern, which are replaced higher up by alpine pastures before cultivation is no longer possible in the nival stage.

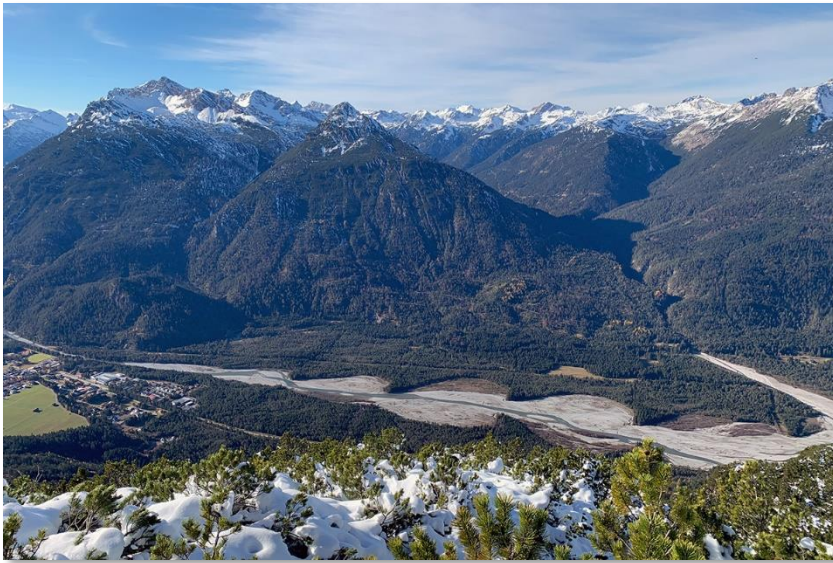


Figure 83  
 One of the last natural rivers is the Tyrolean Lech with the Lechauen. © Naturpark Tiroler Lech

### Neighbouring

In the north, the Außerfern borders on Germany and in the south it is separated from the Inn Valley by the Lechtal Alps and the Mieminger Mountains. On the Mieminger Plateau bordering to the south, silage farming is practised in addition to haymaking, which is why this does not count as part of the region.

## 4 Tyrolean Oberland

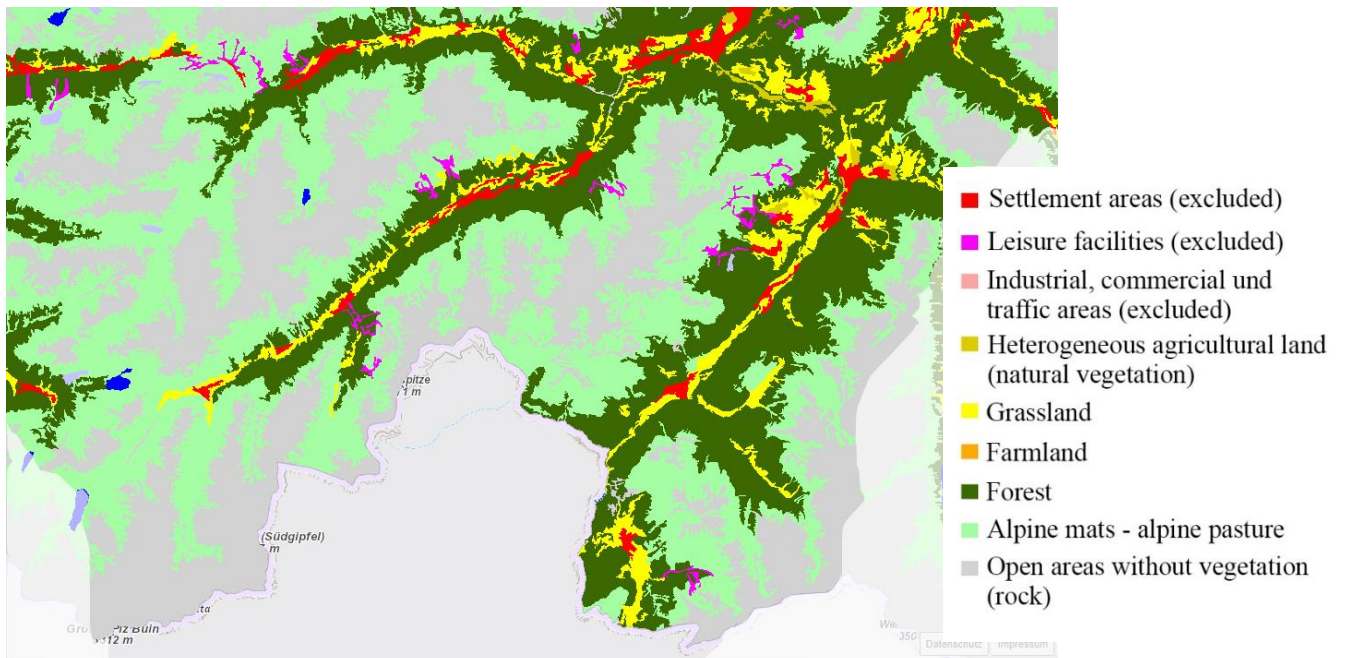


Figure 84  
 Tyrolean Oberland

The Tyrolean Oberland is characterised by narrow valleys - from west to east Stanzertal, Paznaun and Oberinntal - and high mountain peaks. The highest mountain is the Wildspitze at the head of the Pitztal

valley at 3770 metres. Outside the villages, which - like everywhere else in the region - are located on the valley floor, the valleys are characterised by narrow strips of grassland surrounded by forest. Above the forest line there are alpine pastures.

The valleys of the Tyrolean Oberland are also home to mountain railways, which must be excluded. These recreational facilities belong to the tourism industry. Although the economic sector is closely linked to haymaking and especially to alpine pasture management (see Chapter IV. 5.3), it is only indirectly related to it.

### Neighbouring

In the south, the Tiroler Oberland borders on Switzerland and Italy, in the north on the Außerfern and in the west on the Montafon. The next valley to the east is the Ötztal, which is intensively farmed and therefore does not belong to the region.

## 5 Wipptal and Stubaital

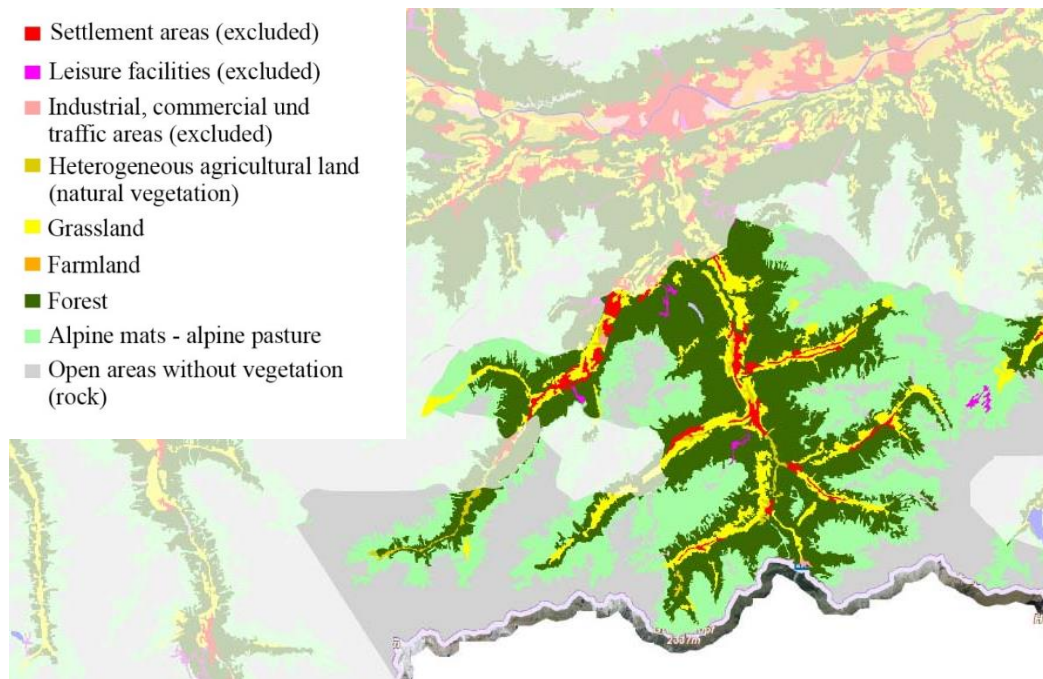


Figure 85  
Wipptal with side valleys - the Stubaital is the north-western side valley

The Wipptal is one of the main traffic arteries through Tyrol, connecting north (Germany) and south (Italy). The Brenner motorway runs through the valley, which is of course excluded from the GIAHS region. In addition to this - and in part also below it - the Wipptal is also characterised by the grassland areas of hay farming, which are located around the settlement areas of the densely populated municipalities. At the higher altitudes above this, there is also forest here, which is a spruce-dominated coniferous forest. Above the forests, pasture and alpine pastures are also found here, as in the entire mountain area.

The side valleys of the Wipptal are for the most part quite narrow and only populated with small villages that are strongly characterised by agriculture and forestry. An exception to this is the Stubaital, which branches off from the Wipptal in the northwest and was developed for tourism early on. It has a dense infrastructure of leisure facilities (mountain railways, pink), which are of course excluded from the GIAHS region. The mountain railways (pink) in the Wipptal are also excluded from the region.

### Neighbouring

In the north of the Wipptal valley, the middle Inntal valley extends in an east-west direction with the conurbation around the provincial capital Innsbruck. This area is not part of the hay-milk region, as the settlement area is extensive and the surrounding agricultural land is intensively farmed, partly also with arable farming.

The northern part of the Ötztal is farmed by a mixture of hay and silage farming, as already mentioned, and therefore does not belong to the region.

In the south, both valleys border on Italy.

## 6 Zillertal - Gerlos

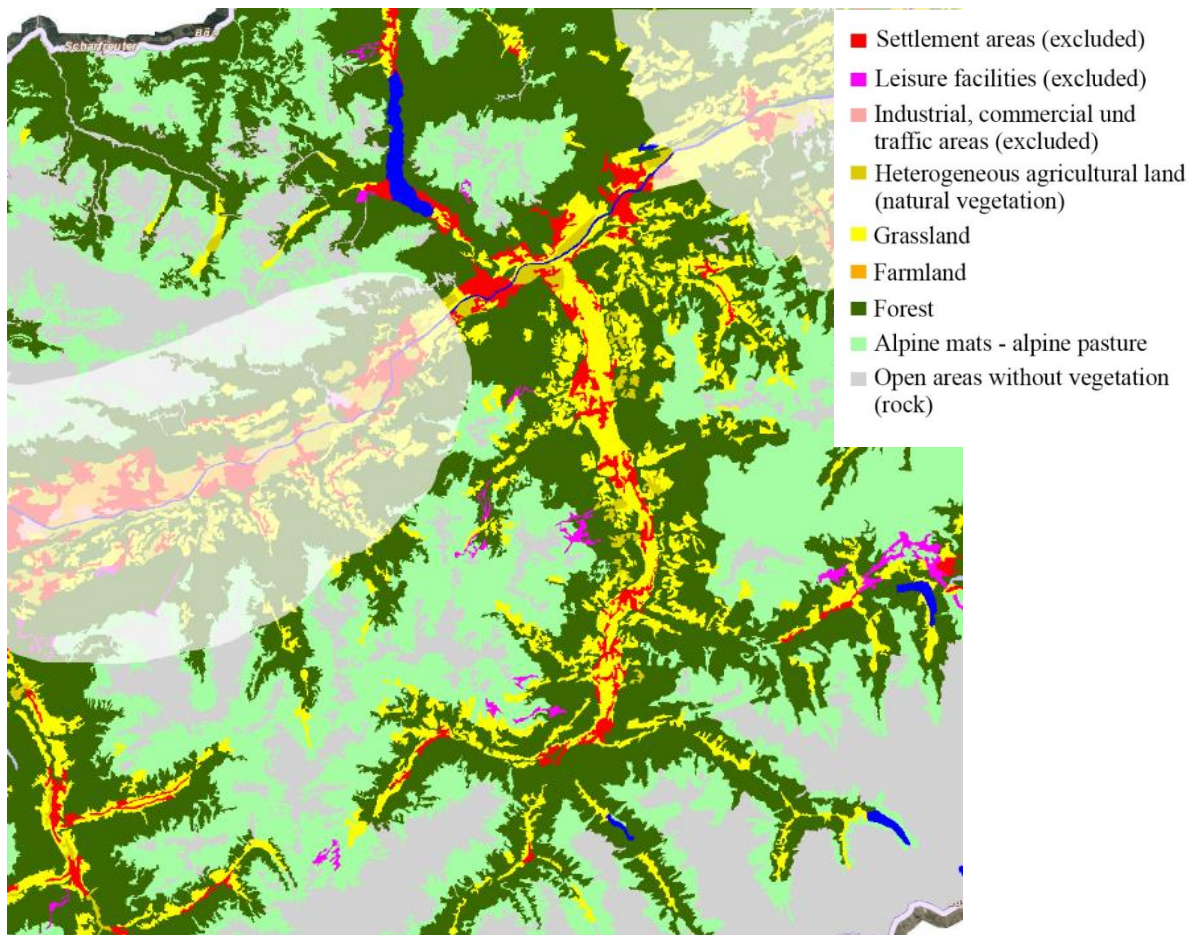


Figure 86  
Zillertal - Gerlos



Like the other Alpine valleys in Tyrol, the Zillertal is also characterised by a mixture of tourism and hay farming. The landscape, which has been created by hay farming over centuries, has laid the foundation for the valley's tourism success and still ensures that guests feel comfortable in summer and winter.

The Zillertal's mountain railways are an expression of the valley's tourism success and are just as much an exclusion from the GIAHS region as the Stillup and Zillergrund reservoirs (dark blue) at the ends of the valley.

In the Zillertal, the villages (red) on the valley floor are strung together like pearls on a necklace. They are surrounded by permanent grassland, which is cultivated by hay-milk farmers. At higher altitudes, the forest follows and above it the alpine pastures.

To the west of the Zillertal, south of the Inntal, there are some alpine pastures.

In the north of the Zillertal, the hay-milk region crosses the Inntal at Jenbach, which runs in an east-west direction. North of Jenbach, a high plateau extends eastwards and the valley "Eng" in the west of the Achensee. Here there are some alpine pastures in the alpine level.

### **Neighbouring**

The area is bordered in the south by the Zillertal Alps, which with 72 three-thousand-metre peaks close off the valley to Italy.

In the north-east and north-west, the Inn Valley is a zone that does not belong to the region. The Inn Valley is densely populated and an important traffic artery. Agriculture is very intensive in this zone, mostly arable farming, but also silage farming.

To the east and west of the Zillertal are other hay-milk areas in the Wipptal and Brixental valleys (see separate detailed maps).

## 7 Kitzbühel Alps – Kaisergebirge

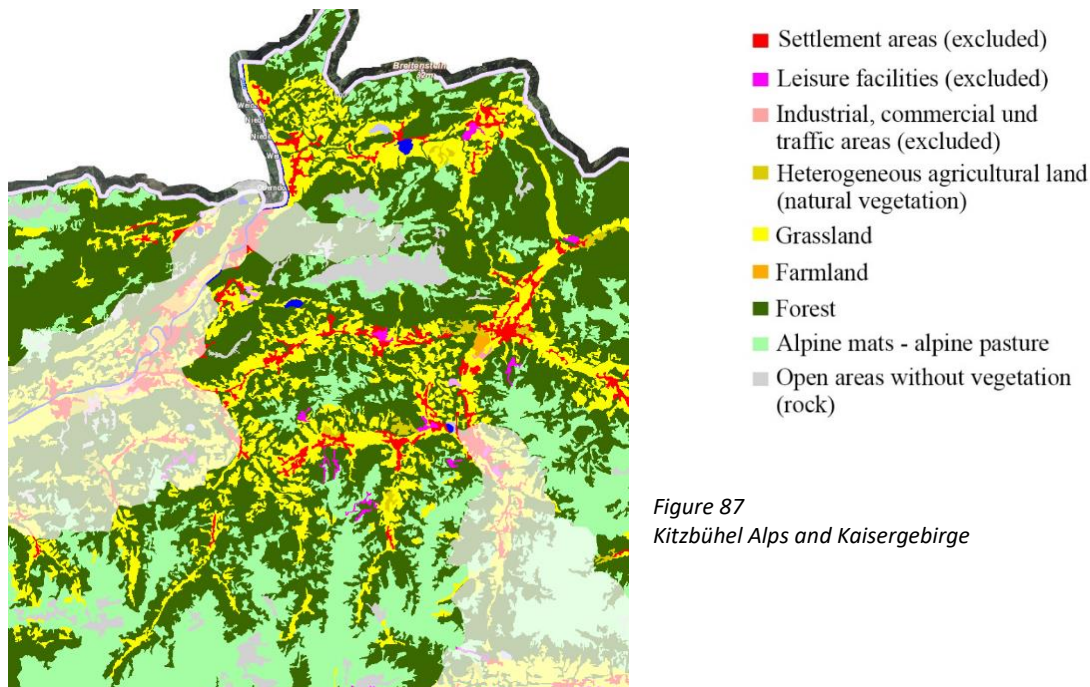


Figure 87  
Kitzbühel Alps and Kaisergebirge

Around the Kaisergebirge (Wilder and Zahmer Kaiser), the Brixental and the Leoganger Steinberge is a classic hay-milk region. This region is also characterised by agriculture on the one hand and tourism on the other. Tourism has been able to develop particularly successfully here because not only the appealing cultural landscape characterised by hay farming attracts guests, but also the proximity to Germany and especially to the metropolitan region of Munich make the destination attractive. The density of mountain railways (pink) is due to this focus on tourism.

The villages also crowd the valley here and are to be excluded from the region as mixed-use settlement areas. They are surrounded by permanent grassland, which is replaced by a narrow strip of forest to finally change back to alpine pastures at higher altitudes.

### Neighbouring

The Inn Valley borders the region in the west. The Inntal conurbation is not only particularly densely populated, but also a main European traffic artery for transit between Germany and Italy. Agriculture is intensively practised here, especially arable farming and dairy farming with silo farming.

## 8 Osttirol

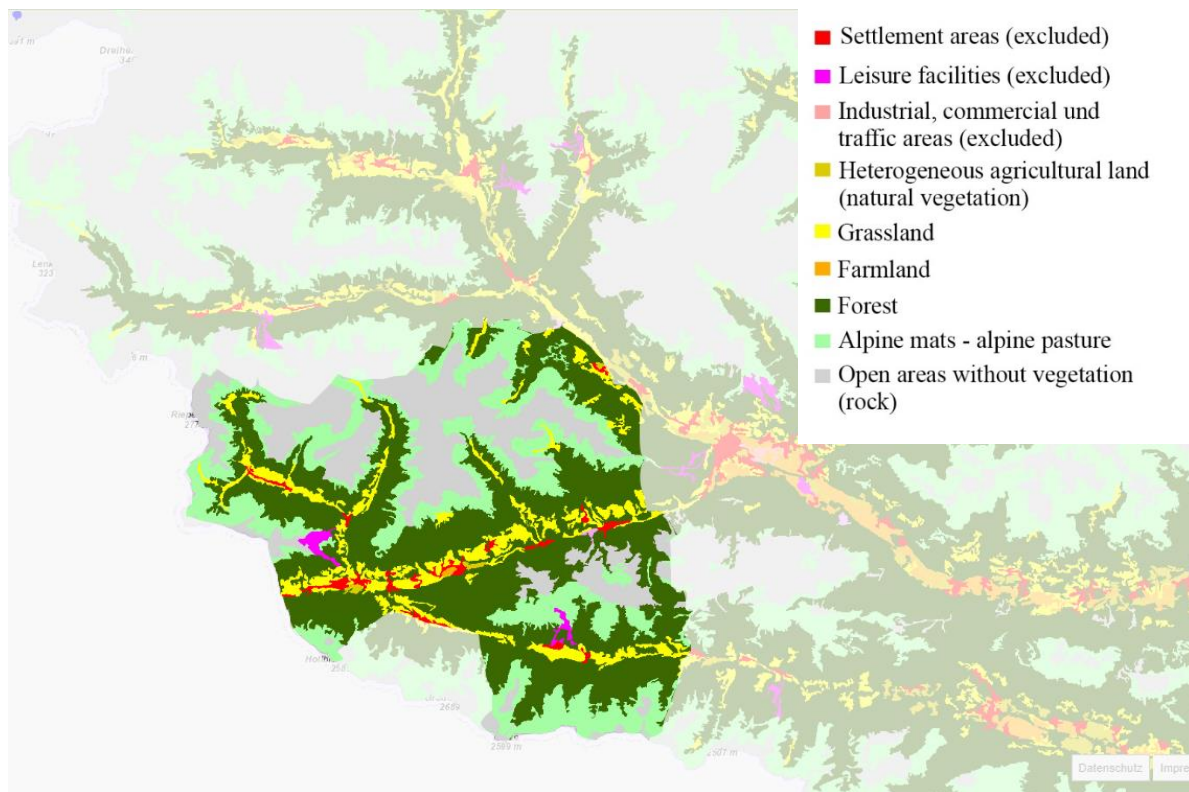


Figure 88  
Osttirol

Hay farming has always been practised in the Pustertal valley in Osttirol. The comparatively wide valley is characterised by the permanent grassland areas of hay farming and the overlying forests and alpine pastures. The heterogeneous agricultural areas in this area are agroforestry areas and are not directly connected to hay farming.

Recreational areas (mountain railways/ski areas) are also to be excluded from the GIAHS region.

### Neighbouring

In the west, the region borders on Italy, where dairy farming with hay is practised, but not according to the hay-milk regulation on which the region is based.

In the valleys to the north and east of the area, arable farming (especially in the Lienz basin) and silage farming are also practised. These valleys are therefore not to be counted as part of the region.

## 9 Western Pinzgau and Loferer Steinberge

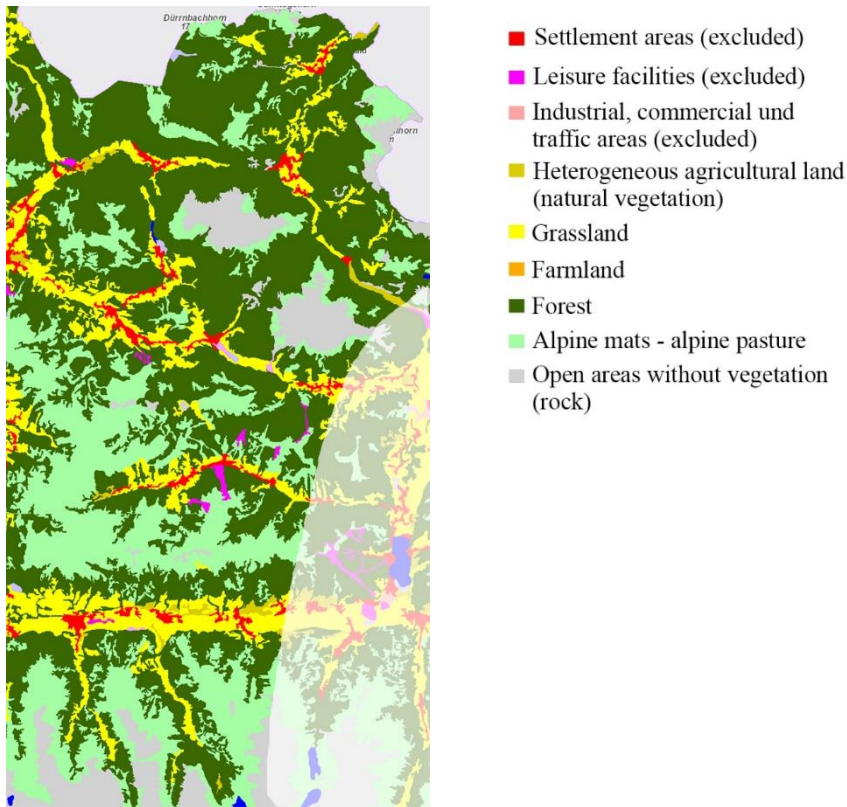


Figure 89  
Western Pinzgau and Loferer Steinberge

The western Pinzgau is also characterised by mountains and valleys, whereby the settlement areas - as shown on the map - are located in the main valley. Here, too, the permanent grassland is fringed by forests. At higher altitudes there are alpine pastures until finally the vegetation ceases altogether.

To the south are the mountain groups of the Großglockner and the Großvenediger - Austria's highest and fifth highest mountains respectively. The landscape is correspondingly rugged and devoid of vegetation.

### Neighbouring

The area to the east is mixed silage and hay milk and is therefore not part of the GIAHS region.

## 10 Flachgau and Mondseeland

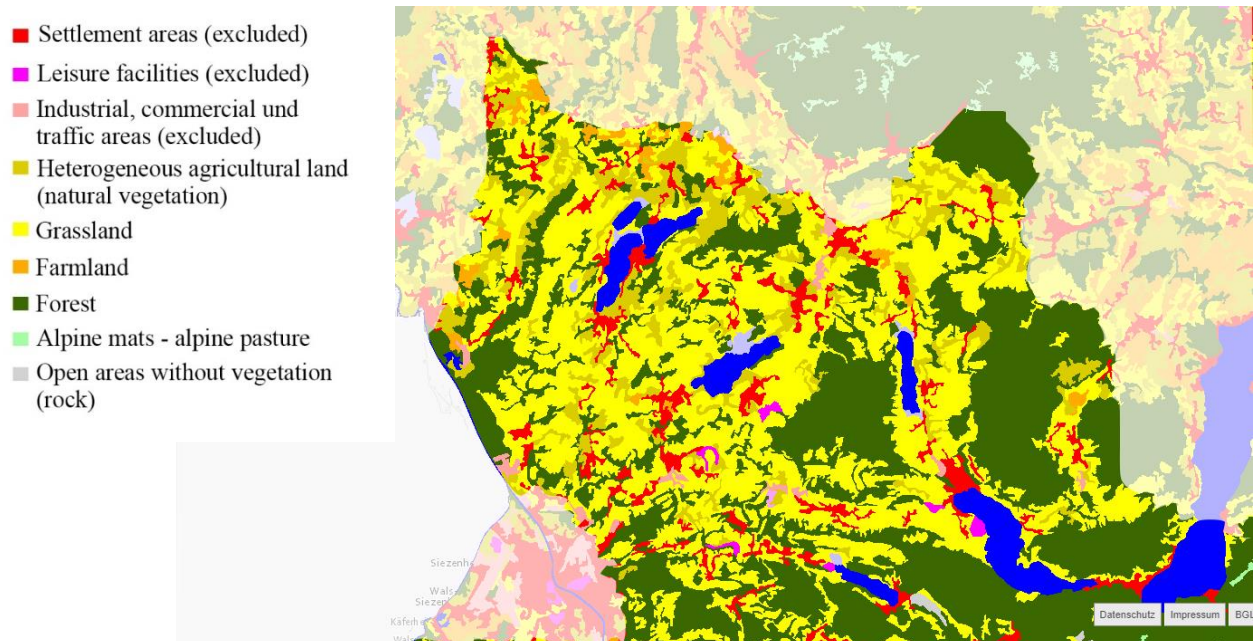


Figure 90  
Flachgau and Mondseeland

The Salzburg region Flachgau and the neighboring Mondseeland are an exception among the hay-milk regions. This is the only region not characterised by high mountains, but by gentle hills. For this reason, there are no alpine mats here, but the meadows and pastures in the favourable areas are much more extensive than in other regions. Hay farming has been preserved in this favourable location because the cheese tradition of this region (Emmentaler) was dependent on a high-quality raw material until the 1990s and therefore set up silage restricted areas where no silage could be produced.

The areas designated as heterogeneous agricultural land consist of natural vegetation (bogs, reed belts) in the area of the lakes. They are to be excluded, as are the lakes that give the region its character. In the peripheral areas of the lowlands there are also fields where hay-milk farmers grow field fodder (fodder clover, lucerne).

### Neighbouring

In the southwest is the provincial capital of Salzburg, which is not part of the region. To the west, north and east, the region merges into an arable farming region, which is no longer part of the hay-milk region.

To the northeast begins the Kobernaußwald, one of the largest forest areas in Central Europe. However, this differs from the forests in the hay-milk region due to the topography and is no longer part of the region.

## 11 Tennengau

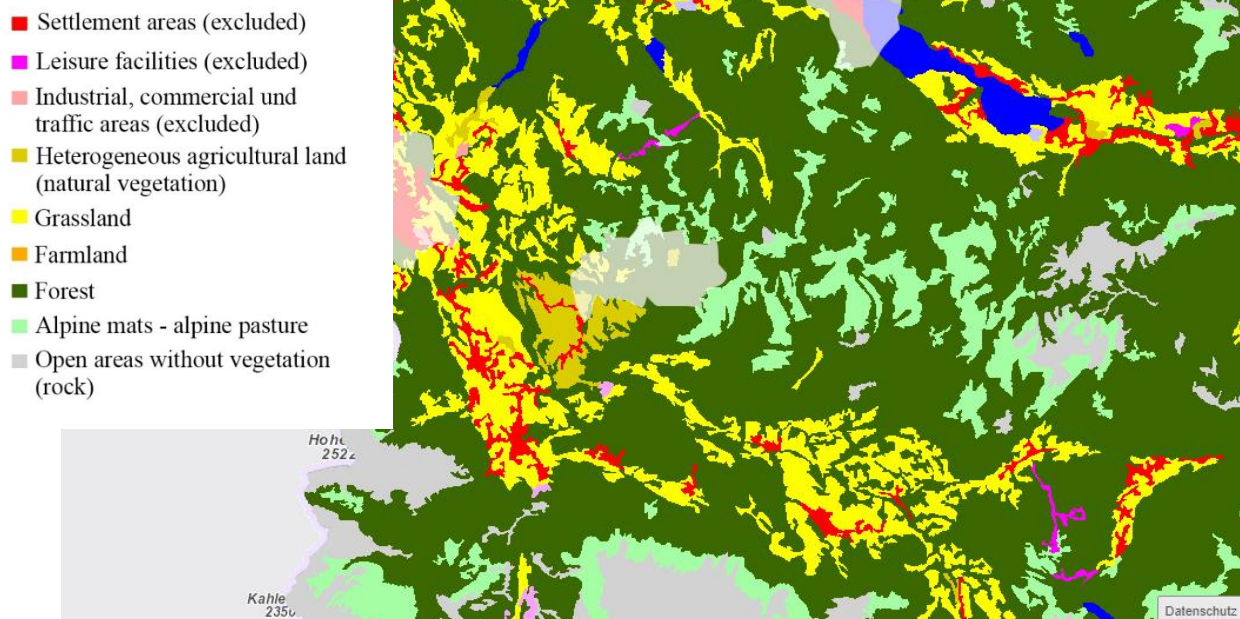


Figure 91  
Tennengau

The Tennengau is a mountain region with a pronounced hay economy. In the more favourable valley locations are the settlement areas (to be excluded) and the grassland areas. Above this, as in other regions, are the forests and, to a lesser extent, the alpine pastures.

In the centre of the area is a larger area of grassland interspersed with forest islands and rows of bushes. This also belongs to the region.

### Neighbouring

In the north-east, the area borders on the conurbation around the provincial capital of Salzburg, which already begins at Hallein. This does not belong to the region.

## 12 Murau and Murtal

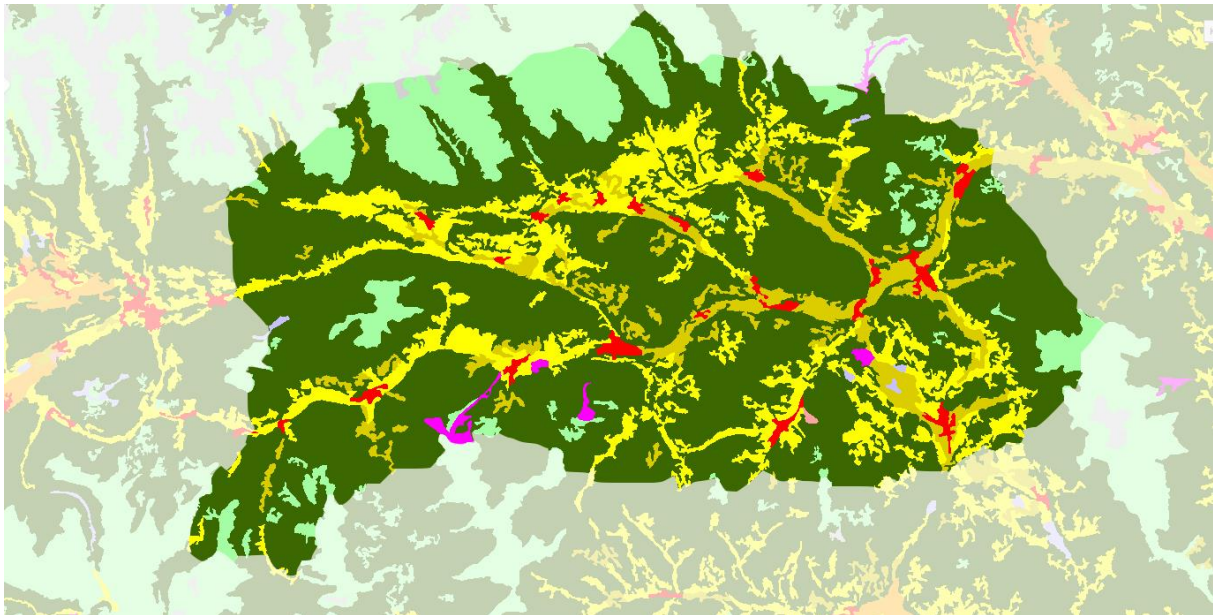


Figure 92  
Murau and Murtal

The Murau - Murtal region in the province of Styria is also located in the mountainous area - the farms and permanent grassland lie between approx. 700 and 1400 metres above sea level and the area is relatively sparsely populated. Accordingly, hay farming is practised extensively here. Typical for Styria is a high proportion of forest, which can be attributed to the region. The structure of the region is comparable to other mountain regions of hay farming with settlement areas in the valley (to be excluded) surrounded by permanent grassland. The alpine pastures are located in the higher altitudes. Narrow valleys are found especially in the west of the area, comparable to the valleys in Tyrol and Vorarlberg with a very small-scale farm structure. Exceptions are, as in other areas, the mountain railways (pink), which are clearly visible as recreational facilities.

The heterogeneous agricultural areas (ochre) are located in the favourable locations of the area and are mixed with permanent grassland and arable land, with fodder and cereals being grown on the arable land by the hay-milk farmers.

### Neighbouring

In the west, the area borders on the Salzburg Lungau, which is located in the mountains, but where the share of silo farming is higher. To the north follows the Enns Valley, which is wider and therefore also more intensively farmed with silage.

In the south and east, foothills of the Alps border the area. Here, arable land is already replacing permanent grassland.

- Settlement areas (excluded)
- Leisure facilities (excluded)
- Industrial, commercial und traffic areas (excluded)
- Heterogeneous agricultural land (natural vegetation)
- Grassland
- Farmland
- Forest
- Alpine mats - alpine pasture
- Open areas without vegetation (rock)

## 5.5. Alpine areas and lakeland region

The western and southern part of the hay milk region is characterised by its Alpine location. Here, the flat areas on the valley floor are severely limited and were also only suitable for arable farming to a limited extent in the olden days, as the soil near the river was often marshy and regularly flooded.

The population therefore settled at higher altitudes early on, where they were protected from flooding. Farms in Alpine locations at 1,000 metres above sea level are not uncommon here; in individual cases farmers have also settled at up to 1,800 metres above sea level and higher<sup>86</sup>. Cattle and dairy farming are also possible in these Alpine locations.

Especially in these exposed locations, hay farming is a guarantee that cultivated areas are kept open and do not become overgrown. It also protects against erosion. The open meadows and Alpine pastures also benefit tourism, which is the most important economic sector in the Alpine regions today.<sup>87</sup>

Outside the main ridge of the Alps, hay farming has been able to survive, especially in the Flachgau region (province of Salzburg). This landscape features rolling hills and lakes and is much more accessible than the Alpine hay milk areas. The farming method of the hay farmers here therefore differs from that of the mountain farmers in the Alpine parts.



*Figure 93  
Hay mowing in the lakeland  
region*

Instead of taking the animals to the Alpine pastures in summer, here they can spend a large part of the year on the pastures around the farms. However, even in this region the winters are cold and snowy, so in summer hay must be produced and stored for the cold season.

Originally, this region was shaped by agriculture. With the expansion of the railway lines towards the end of the 19th century, however, it became possible to transport cheaper grain from more remote areas of the Habsburg monarchy to the Austrian heartland. This deprived the market of domestic grain.

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<sup>86</sup> One example is the Stables Hof in Nauders at 1810 metres above sea level, which has been farmed for more than 400 years and where haymaking is still practised today.

<https://www.nauders.com/de/ggv/bergbauernhof-stables-hof-fur-selbstversorger?id=78435>

<sup>87</sup> The share of direct value added of tourism in the GDP amounted to 5.5% in Austria in 2019, 13.8% in Tyrol as the most touristic federal province. The indirect value added was even 7.5% Austria-wide, in Tyrol 16.3%.



Farmers were forced to focus on another product and found an alternative in dairy farming. Cheese was a popular product that could also be sold to the larger cities, especially Vienna.



*Figure 94  
In the hilly lakeland region, the animals spend a large part of the year on the pastures near the farm.*

Thus, a distinctive Emmental production developed in Flachgau, which still exists today. Since the production of Emmental requires a high-quality raw material, silo-free milk production was maintained in this region.

In addition, through the activities of ARGE Heumilch, other areas that are not traditionally hay regions have been won over to hay farming. Mention should be made here of farms in the Mühlviertel and Montafon, as well as farms in the districts of Klagenfurt, Spittal an der Drau and Bruck-Mürzzuschlag.

## **5.6. Alpine farming**

Hay farming is practised both in the mountain area and in favourable locations (especially in the Salzburg lake area).

Alpine pasture farming is a special form of hay farming that is practised in the mountain area. Here, the cultivable land in the valley is very limited and is needed for haymaking in order to produce enough fodder for the winter. Therefore, the cattle (or part of them) are taken to more or less nearby mountain pastures (alpine pastures or alps) in summer. This has several advantages: On the one hand, the land and human resources in the valley can be used for hay production. On the other hand, the animals also benefit from the alpine pasture, because it offers them not only sufficient exercise, but also particularly species-rich food and cooler temperatures that are pleasant for cattle.

The areas on the alpine pastures are at an altitude of about 1000 to 2000 m above sea level and would not be suitable for cultivation as arable land, for example. (see "Cultural landscape of the region"). They developed from the primeval meadows, but were extended downwards by grazing and clearing.



*Figure 95*

*Alpine pastures are mostly located at the transition from the montane to the alpine stage. The pastures are surrounded by forest on the one hand and rock on the other. The photo shows the Alpe Steris in the Great Walser Valley and was taken during the field visit in August 2023.*

In addition to grazing, alpine pasture farming also fulfils other important functions for society in the mountain area:

- Keeping the landscape open: It is only through alpine pasture management that the characteristic cultural landscape has come into being. Without alpine pastures, the areas would become forested again within a few decades and would be inaccessible.
- Advance services for tourism/recreation: Mountain areas in particular live to a large extent from tourism. The alpine pastures make an important contribution to this, on the one hand by providing the areas and maintaining the paths, and on the other hand by being popular places of excursions themselves. More and more, the local population also uses the alpine pastures as leisure and recreation areas.
- Protection against natural disasters (avalanches, mudflows): The grazing of the alpine pastures creates a soil with dense vegetation that can protect against both mudflows in summer and avalanches in winter.



*Figure 96*  
*Alpe Erles Finne is one of the many alpine dairy farms in the Bregenzerwald.*



*Figure 97*  
*Even today, the milk is often processed directly on the mountain pasture. Mountain cheese or Alpine cheese enjoys particular popularity in the market. The picture shows cheese production at Alpe Erles Finne.*

### 5.6.1. The way from the valley to the alpine pasture

As already explained, between the colline level, where farms, permanent grassland and valley pastures are located, and the alpine level, where the alpine pastures are located, lies the forested montane level. Even though the forest is very dense in many places, it is criss-crossed by paths and roads that lead to the alpine pastures. They make use of the terrain and often run along streams where the forest is not so dense.

These roads vary in quality. Rarely are they still narrow paths or hollow ways, more often today they are gravelled forest roads that can also be driven on by tractor or small trucks. As in the past, the alpine animals are still often driven on foot along these roads and paths to the alpine pastures in spring and back to the valley in autumn.



*Figure 98  
Bringing down the cattles from  
the alpine pasture through the  
forest © Peter von Felbert /  
Tourismusverband Wilder Kaiser*

In other cases, however, the cattle are brought to the mountain pasture by lorries or tractors with trailers.



*Figure 99  
Children bring the animals together before bringing them  
down from the alpine pasture. (The photo was taken  
during the field visit in August 2023 at Alpe Steris).*

The distance of the alpine pastures from the home farms can vary greatly, as the alpine pastures have developed differently historically. In most cases, the alpine pastures were at some point communal pastures that were managed in some form by the farmers of one or more villages. From this, agricultural communities have sometimes developed that still manage the alpine pastures collectively today. Some alpine pastures are privately owned and others are owned by the public sector (municipality). Today, which farms drive their cattle to which alpine pasture usually depends only on the distance, the costs and a certain preference for the area or the farmer.

Therefore, the distance for transport can also vary greatly. Often the mountain pasture is so close to the farm that the animals can be driven up on foot, even if this means a long and exhausting march for man and animal - sometimes even over 2 days. Small, vigorous breeds that are especially capable of crossing the terrain are advantageous. (see proposal chapter IV, 2)

On alpine pastures the milk is processed directly. Alpine cheese or alpine cheese (this is the name given to cheese produced directly on the alpine pasture) is therefore a rarity that is known and sought after beyond the region. (The whey produced during processing is often fed to alpine pigs, which are also a speciality among alpine foods and a by-product of alpine farming).

If the milk is not processed on site, it has to be brought down to the valley quickly. There are various systems for this. Either the mountain pastures themselves are responsible for the transport, in which case it is either done with their own vehicle (tractor) or also, for example, with a material ropeway.



*Figure 100*  
*Milk cans on a material ropeway © Rupp*

However, as the alpine pastures are nowadays mostly accessible by forest roads, they are often also integrated into the milk collection system of the processing companies. Then every 1-2 days the milk collection truck comes - often in an adventurous drive over steep, narrow roads - to collect the milk.



*Figure 101*  
 The milk collection truck collects the milk from an alpine pasture.  
 © ARGE Heumilch

The buildings of a traditional mountain pasture are simple and functional. The focus is on work and not on comfort. Often there is no electricity, but running water is usually available - even if only cold.

On alpine pastures, in addition to the farm and living quarters, there is of course also a small cheese dairy and a cheese cellar where the alpine cheese is cared for.



*Figure 102*  
 Alpine dairy on the Steris alp in the Great Walser Valley – photos taken during the Field Visit in August 2023



*Figure 103  
Alpe Eris Finne in Bregenzerwald –  
photos taken 2022*

Some alpine pastures are small mountain villages themselves, where each participating farm has its own alpine hut. These have evolved from communal alpine pastures where the animals were herded and looked after together, but each farm was responsible for its own milk.



*Figure 104  
Alpe Steris - a small village on the  
mountain © Helmut  
Düringer/Vorarlberg Tourismus*

### **Hereditary farms**

The farms in the valley are also mostly very traditionally designed and often very old. If a farm has been owned by the same family for at least 200 years, it can apply for the distinction "Erbhof".

## Forms of hay farming: comparison of alpine pasture farming and pasture farming

### Alpine pasture farming

- Favorable land in the valley limited
- Cattle (or parts of them) are moved to mountain pastures (alpine pastures) in summer
- An alpine pasture/alpine meadow refers to a fixed area of mountain pasture in summer, including farm buildings
- The number of alpine pastures declined sharply from 2000 to 2020, but has remained stable since then (about 8000 throughout Austria)
- However, fewer and fewer cattle are being calved (not every farmer sends his cattle to the alpine pastures, not all the livestock is calved)
- In addition to grazing, alpine pasture management fulfills other important functions:
  - Keeping the landscape open
  - Preliminary work for tourism/recreational economy
  - Protection against natural disasters
- Alpine pastures can be privately owned, municipally owned, agricultural communities
  - Regionally there are also real alpine pasture villages
- On some alpine pastures the milk is processed directly into cheese, on others it is collected, still other alpine pastures are pure Galtviehalmen and have no milk
- alpine pastures are located at 1000-2000 m above sea level
  - A special form is the three-stage farming: explain; reference to UNESCO World Heritage Site in Bregenzerwald
- Transport to the alp mostly by foot, sometimes by tractor/truck - depending on how far the alp is from the home farm
- Standard of the alpine pastures particularly high

### Pasture farming in favorable locations

- Cattle stay on the farm all year round
- Hay farming goes back to the hard cheese tradition (silo restricted areas)
- The animals graze near the farm instead of being sent to the mountain pastures.
- The grazing season starts as soon as the soil is dry enough, in March/April and ends in autumn (October/November)
- The haymaking is done in parallel on the other areas of the farm
- The grassland is owned by the farms, sometimes land is rented (e.g. from other farms or the municipality).
- The milk is collected daily or bi-daily from the dairy/cheese factory



## V. ACTION PLAN

Studies<sup>88</sup> on which this application is based have shown that the traditional farming methods of hay milk farmers have a positive effect on the preservation of biodiversity and the protection of the climate, maintain jobs in rural areas and are the basis for the preservation of small, family-run farms.

Thus, the continuation of hay farming has positive impacts on all three dimensions of sustainability - environmental, economic and social. The measures that contribute to conservation should therefore also take all three dimensions into account.

In order to contribute to the preservation of the economy, it is important to know the biggest threats.

### 1. ANALYSIS OF THREATS AND CHALLENGES

The key threat facing the hay farming industry is a push back in farming practices as hay dairy farmers either convert their farms to other farming practices or abandon them completely.

The challenge, therefore, is to keep farms in hay farming and thereby strengthen small-scale farming structures in mountain areas.

In terms of the GIAHS criteria, the following threat scenarios emerge:

#### - **Food & livelihood security.**

Hay farming is more costly than other dairy farming systems and, in addition to costly hay promotion, comes with its own set of regulations (hay milk regulations, see Appendix 1) that hay milk farms must adhere to. Therefore, it may seem tempting for farms to switch to other farming practices (silage farming) or to exit dairy farming (switch to breeding operations, abandon the farm). If the small-structured hay farming industry with family-owned farms is to be maintained, the following challenges must be met in the future:

- The additional expense incurred by hay farming must be compensated by a higher milk price (hay milk surcharge).
- The self-confidence of hay-milk farmers must be maintained at a high level.

In order to be able to pay an adequate hay-milk surcharge, it is also important that the processors are able to earn this surcharge on the market. It is therefore important to raise awareness in the most important sales markets (Austria and Germany) of the special farming method and the advantages of hay-milk. Only then will consumers continue to be willing to pay a somewhat higher price for hay milk.

#### - **Agro-biodiversity**

It is precisely the small structures of hay farming that make a major contribution to the preservation of biodiversity. The mosaic-like management (see chapter IV 2), which in turn is caused by the small-scale structure of the areas and farms, as well as fewer cuts ensure the continuity of biodiversity on the meadows and pastures of hay-milk farms. Therefore, if hay

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<sup>88</sup> Zollitsch et.al., 2019 / Suske et al., 2020

farming were to be discontinued and the land managed in other ways, biodiversity would suffer greatly.

If the cultivation of the areas in the mountain region were to be abandoned, they would become overgrown with bushes within a few years and become forested within a few decades. The cultural landscape, from which the region is characterized and from which the leading tourism industry strongly profits, would disappear.

However, the continued existence of cattle breeds typical of the region is also linked to haymaking. Old breeds with a moderate milk yield but ideal genetic makeup for the mountain area (see chapter IV 2 Cattle breeds) such as Tyrolean Grey cattle, Pinzgauer or Tux-Zillertaler as well as the Ennstaler Bergschecken would be endangered.

#### - **Local and traditional knowledge systems**

As described in chapter IV, 2, haymaking is accompanied by a profound knowledge of haymaking. This concerns both the traditional haymaking as ground hay, which goes hand in hand with a lot of experiential knowledge, especially in mountain areas, and the contemporary drying with the different drying systems.

Hay farming is also taught in agricultural training, and some of the training farms operated by the agricultural training institutes are even hay-milk farms. In addition, hay drying advice is provided by ARGE Heumilch and the Chambers of Agriculture to pass on up-to-date knowledge.

Because the land is very small-scale, the knowledge of how best to manage it is also very specific. One farm may have a wet meadow that is difficult to machine, while another farm nearby has more dry but particularly steep land. The moment a farm is abandoned, the specific knowledge that the family has acquired over generations about its land is lost.

In the case of cattle breeds, knowledge is less limited to individual farms, but even here the decline of hay-milk farms would mean a loss of knowledge about rare breeds. This mainly concerns regions where specific breeds are bred such as the Zillertal, the Tyrolean Oberland, the Pinzgau, etc.

Cheese dairies that process hay milk also have special knowledge. As described in Chapter III, 4.3, hay-milk has advantages especially for the production of long-maturing cheeses. Just as this cheese culture has contributed to the preservation of hay farming (silo restricted areas), a loss of hay farming would also lead to a loss of craft knowledge in the cheese dairies.

#### - **Culture, value system and social organizations**

A wealth of experience is also available to alpine farmers, who usually have to deal with very specific conditions (see chapter IV, 4.5). For this area, there are different courses offered by different agencies. These would quickly be abolished if the demand were to diminish. The continued existence of alpine pastures not only safeguards the cultural landscape, but also the knowledge of alpine pasture management.

In the case of three-step farming in the Bregenzerwald, this is an intangible UNESCO World Heritage Site that is closely linked to haymaking. The continued existence of hay farming therefore also safeguards this.

The customs mentioned in chapter IV, such as the driving up and down of mountain pastures, traditional costumes and traditional recipes, are probably only conditionally dependent on haymaking. Traditional costumes and recipes are also maintained independently of the hay farmers and even independently of agriculture. However, without haymaking and the alpine

farming associated with it, these traditions would lose their meaning and become more and more eroded. The ritual framework for a long agricultural tradition would become a fad that would be changed at will. Or, to paraphrase Benjamin Franklin, "Only the ashes would be preserved instead of passing on the fire."

#### - **Characteristics of the landscape**

Since the cultural landscape in the region has been shaped by hay-milk farming, it would change dramatically within a few decades once hay farming was abandoned. A foretaste is already visible in the alpine pastures. Even though the number of alpine pastures is quite stable, fewer and fewer animals are being raised, which is leading to increasing scrub encroachment and forestation.

Since the grazed areas help to protect against natural disasters such as avalanches and mudslides, these dangers would increase dramatically. In the event of a decline in hay management, other social/governmental measures would have to be taken to compensate for this protection.

The biggest challenge is to keep haymaking farmers in business. Therefore, all goals must be focused on maintaining or making hay farming environmentally, economically and socially sustainable. Only in this way can the main goal - the preservation of the farming method - be achieved.

All measures in the action plan are aimed at stabilizing the hay economy in a sustainable manner.

## **2. MEASURES**

### **2.1. Ecological sustainability through hay farming**

#### **2.1.1. Austrian Agri-environmental Programme "hay farming" measure**

To maintain and enhance the positive effects of hay farming on biodiversity and climate protection, participation in the Austrian Agri-environmental Programme "hay farming" measure is mandatory for all hay milk farmers and they have to fulfill the requirements.

**Austrian Agri-environmental Programme** is being launched by the Federal Ministry of Agriculture, Forestry, Regions and Water Management as part of rural development (Common Agricultural Policy) and is intended to ensure careful use of natural resources and long-term protection of the climate.

The "hay farming" measure includes:

- No silage preparation or silage feeding on the entire farm
- Ensuring mosaic land use by combining hay farming with green feeding in the form of grazing or pasture during most of the growing season for all roughage consuming animals on the farm.
- No storage of silage on the entire farm
- Delivery of cuttings to third parties only in the form of hay

#### **Goal**

The Austrian Agri-environmental Programme "hay farming" measure will be maintained beyond 2027 and will be further expanded.

### 2.1.2. Training measures for hay milk farmers on biodiversity

- a. ARGE Heumilch regularly informs its hay milk farmers about the biodiversity services of hay farming and how important they are. This topic should be a permanent fixture in the journal "Urgut Leben" in particular, which is published twice a year, and in the e-mail newsletter.
- b. Furthermore, these media highlight techniques that promote biodiversity on hay milk farms, such as particularly gentle mowing techniques or graded meadow cultivation.
- c. Within the framework of information events (e.g. members' meetings of ARGE Heumilch), biodiversity and the techniques to preserve it are regularly addressed.

#### Goal

Biodiversity areas should be increased by 2% by 2028.

### 2.1.3. Communicating the benefits of hay farming in the region

- a. The award of status as a GIAHS region will be widely communicated within the region. The communication channels of ARGE Heumilch are used for this purpose:
  - i. Newsletter
  - ii. Social Media
  - iii. Website
  - iv. Podcast
- b. Press releases are also used to promote the GIAHS region within the region and nationally. Subsequently, the GIAHS region will be included in the standard text of ARGE Heumilch and will be included in every subsequent press release on any topic.

#### Goal

Awareness of the GIAHS region reaches 20% among the target audience (HHF ABC1) within the region. This value will be evaluated via a Consumer Connection Study, which will be conducted on a regular basis.

### 2.1.4. 50% organic hay milk farms by 2030

To further enhance the ecosystem services of hay farming, the already well above average organic share of 38% currently should be increased to 50% by 2035.

The demand for organic hay milk on the market currently exceeds the supply. This creates a pull effect that causes the organic share to increase further. With investments in drying technology and animal welfare, switching to organic hay farming is a good option to be able to obtain the higher producer milk price (organic premium).

#### Goal

By 2030, 50% of hay milk farms in the region will be farming organically. This share is measured via the reporting of milk volumes by processors.

## 2.2. Economic sustainability through hay farming

A farming method can only be sustained in the long term if its economic viability is ensured. Otherwise, farms are abandoned or turn to more profitable farming methods. Therefore, high quality basic ration is essential for maintaining hay farming, as it reduces dependence on the feed market. The higher the quality of the basic ration, the less concentrate has to be purchased.

### 2.2.1. Hay dryers

The highest basic ration quality can be achieved with hay dryers because with the help of this technology, the hay can be dried faster and more intensively than with soil drying. Investments in hay drying technology therefore make a decisive contribution to preserving the hay farming industry.

Overall, 5% of hay milk farms are expected to improve their drying situation each year. This means not only moving from soil drying to hay dryers, but also, for example, from cold ventilation to ventilation with a dehumidifier or warm ventilation.

#### Goal

The percentage of farms with hay dryers will increase to > 90% by 2030. This will be evaluated through a survey of hay milk farms.

#### a. Consulting

To achieve the best possible basic ration quality and maximum economic efficiency in hay dryers, planning and implementation adapted to the individual situation is necessary. Independent advice is therefore provided for hay milk farmers wishing to invest in hay dryers. This is intended to provide information about the technical options and ensure that the most efficient solution is found for each individual operation.

The consultation is carried out by the Chamber of Agriculture and the costs for the initial consultation are borne by ARGE Heumilch.

#### Goal

By 2030, 80 to 100 initial consultations on new and expanded hay dryers will be conducted annually. This value will be evaluated by the advisory office.

#### b. Communication

The advantages of hay dryers are being increasingly communicated among hay milk farmers. For this purpose, the communication channels of ARGE Heumilch (journal "Urgut Leben", newsletter, separate section on the website), but also other target group-oriented media (e.g. farmers' newspaper) will be used.

Seminars on hay dryers will be offered in the region for interested farms.

#### Goal

At least 1 seminar on hay drying annually by 2030. This will be evaluated by the advisory office.

### 2.2.2. Photovoltaics

Hay dryers require energy for blowers and, if necessary, dehumidification and heating. This energy can be generated with photovoltaics not only in an environmentally friendly way, but also in a cost-saving way over the medium and long term. Photovoltaics (PV) also increases independence from fluctuating energy prices. PV is particularly suitable for hay dryers:

- Haymaking takes place in the summer when PV can generate the most energy.
- Farms have large roof areas on barns and stables that are ideally suited to PV.

The air that heats up under the PV system can be extracted and used for drying. This in turn cools the PV panels and makes them even more efficient. The aim is to make hay milk farms self-sufficient in terms of energy, as the energy generated can be used for the entire farm, in particular for cooling, milking technology, etc., in addition to hay drying.

- a. The benefits of PV are communicated to farmers through ARGE Heumilch and the hay drying advisory service.
- b. Political decision-makers are being convinced of the benefits, to further expand support measures for PV in this area.

#### **Goal**

By 2035, 75% of hay milk farms are equipped with PV systems or comparable renewable energy sources for hay drying. This value will be determined via a survey of hay milk farms.

### 2.2.3. Marketing of products

The activities of ARGE Heumilch have already contributed to the fact that hay milk is established as its own type of milk and that products made from hay milk enjoy a high level of recognition. This is also necessary to ensure the economic viability of the hay farming industry.

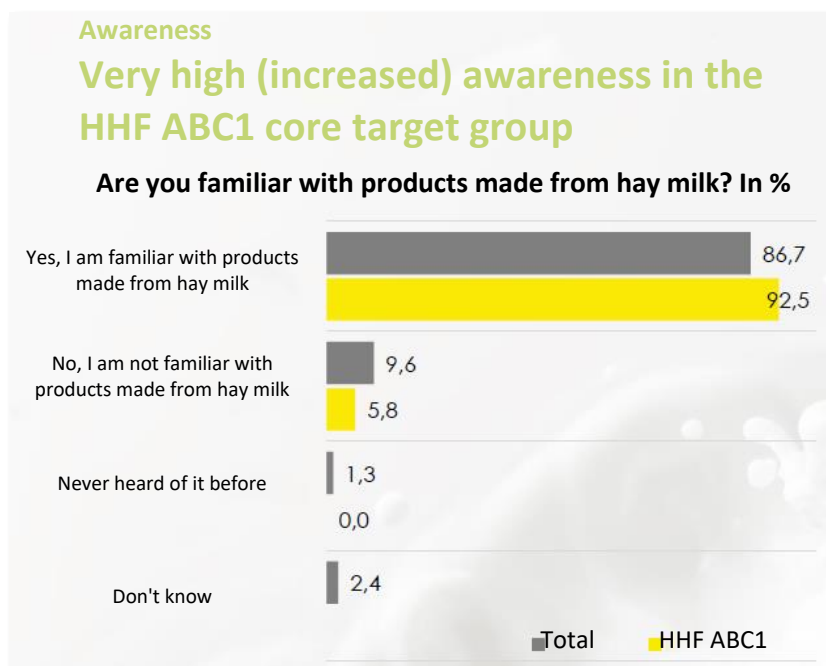


Figure 105  
 CCS Follow Up Study hay milk, 11/2021  
 Based on adult population 15-64 years

ARGE Heumilch is seeking funding from Austria and the EU to be able to continue on its chosen path with the marketing of products made from hay milk and to establish hay milk as a traditional and sustainable type of milk.

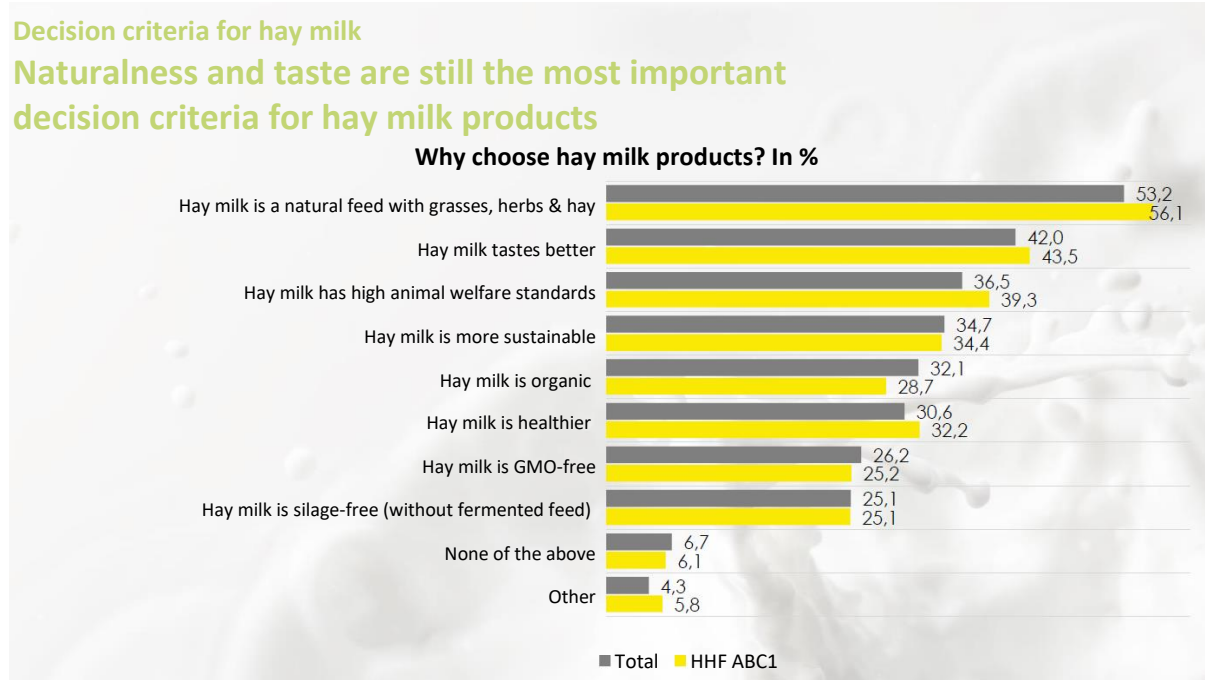


Figure 106  
 CCS Follow Up Study hay milk, 11/2021  
 Based on: Adult population 15-64 years

Hay milk products are already considered highly sustainable by 34% of the target group. However, to survive in a market where food sustainability is becoming increasingly important, this attribution must be increased further.

**Goal**

Association of the attribute "hay milk is more sustainable" for at least 80% of hay milk buyers by 2030. This value will be evaluated via a Consumer Connection Study, which will be conducted on a regular basis.

**2.3. Social sustainability through hay farming**

**2.3.1. Actively maintaining farms**

Agriculture in Austria has been undergoing structural change for decades, with more and more small family-run farms exiting the agricultural sector. The areas are being taken over by larger farms. This change is putting pressure on the hay farming industry because its essence lies in small-scale, family-run farms that practice site-appropriate grassland farming. To keep them in business, not only is the economic success of the farms (see Chap. V 2.2) decisive, but also the satisfaction of the farmers and the success of the generational change on the farms.

Satisfaction with living and working conditions in general is very high among hay milk farmers.

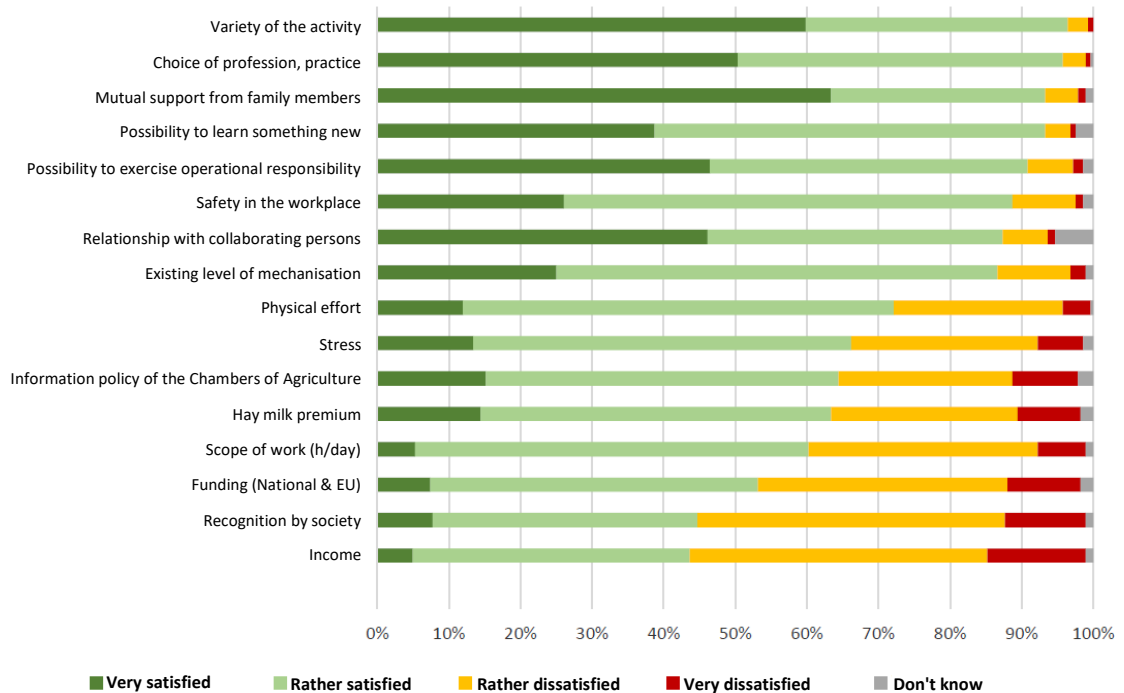


Figure 107  
Survey of Austrian hay milk farmers on job satisfaction<sup>89</sup>, n=284

<sup>89</sup> Zollitsch, 2019; p. 12



A survey<sup>90</sup> among hay milk farmers in 2019 revealed that farm succession was relatively secure (40%) or not yet an issue because the farm manager was still young. Only 11% stated that farm succession was not yet secured.

This suggests a high level of attachment of the younger generation to the region and its farming method.

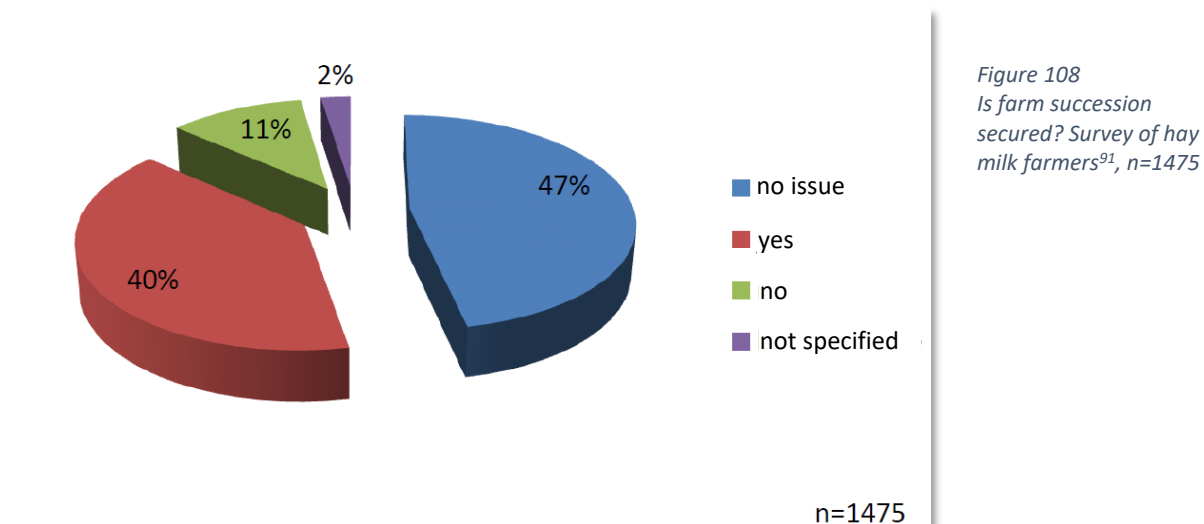


Figure 108  
Is farm succession secured? Survey of hay milk farmers<sup>91</sup>, n=1475

To secure this commitment, the next generation of farmers and their training must be targeted:

- a. Highlighting the opportunities that hay farming provides in the volatile dairy market. Through active communication with hay milk farmers, the advantages and successes of the farming method are made clear.
- b. Strengthening the self-confidence of young hay milk farmers through "hay milk ambassadors", events such as the "Hay Gala" and through the GIAHS region. Role models ("influencers") show the younger generation in particular that hay farming can be meaningful.
- c. Advice for farm handover

#### Goal

Structural change cannot be stopped, but it should be slowed down. A maximum of 10% of hay milk farms should be phased out of hay farming by 2030. The number of establishments will be measured through the reporting of members.

## 4. BUDGET

The measures of the action plan are financed by the membership fees. Members are hay-milk farmers and processing companies. Both pay a contribution to ARGE Heumilch according to milk volume, which is used for the following measures.

<sup>90</sup> Lindner, Kittl, 2016; p. 47

<sup>91</sup> Lindner, Kittl 2016; p. 47

## **5. MONITORING AND EVALUATION**

The tasks are distributed in a kick-off meeting in the ARGE Heumilch team. This is followed by a semi-annual team meeting to monitor progress. Every year, the measures are summarised in a short report.

The following measures are planned to review the targets:

- Survey on the development of hay-milk farms (PV systems, hay drying, farm succession).
- Awareness of the GIAHS region is surveyed as part of a biennial haymilk awareness study.

Objective	What	Who	How	2024	2025	2026	2027	2028	2029	2030	Budget
<b>Ecological sustainability through hay farming</b>											
ÖPUL-measure „Hay farming“	The ÖPUL measure "Hay farming" will remain in place beyond 2027 and will be further expanded.	ARGE Heumilch Österreich, Federal Ministry of Agriculture, Forestry, Regions and Water Management	ARGE Heumilch is lobbying the Federal Ministry to further expand the "hay farming" measure in the ÖPUL programme.	x	x	x	x				
			To this end, the sustainable effects of not using silage are being further researched through scientific studies.	The current ÖPUL period runs until 2027 inclusive.			The ÖPUL period from 2028 onwards is also to include a "hay farming" measure that recognises environmental performance.			€ 150.000	
Increase biodiversity areas by 2% by 2028	Inform hay-milk farmers about the biodiversity benefits of hay farming and how these are achieved.	ARGE Heumilch Österreich	Article in the Urgut Leben Journal about biodiversity on hay-milk farms (e.g. gentle mowing, graded meadow cultivation).	1	1	1	1	1	1	1	€ 7.000
			Information as part of the farmers' newsletter on biodiversity on hay-milk farms	1	1	1	1	1	1	1	€ 700
			Informing hay-milk farmers about biodiversity services at information events / members' meetings	1	1	1	1	1	1	1	€ 1.000
			Newsletter	x	x	x	x	x	x	x	€ 2.000

Awareness of the GIAHS region within the target group (HHF ABC1) is at least 20%.	Communicating the award of GIAHS status	ARGE Heumilch Österreich	Social Media	x	x	x	x	x	x	x	€ 2.000
			Website	x	x	x	x	x	x	x	€ 3.000
	Press releases on the GIAHS region	ARGE Heumilch Österreich	National and international press work incl. press releases on the GIAHS region	x	x	x	x	x	x	x	€ 5.000
			Status as a GIAHS region will be communicated with each subsequent national press release.	x	x	x	x	x	x	X	
Stakeholder event	ARGE Heumilch Österreich	Launch event of the GIAHS for members, opinion leaders and media representatives	x								€ 150.000
Increase the share of organic hay-milk farms to 50%.	Information for hay-milk farms	ARGE Heumilch		38%	x	x	x	x	x	50%	€ 1.000
<b>Ökonomische Nachhaltigkeit durch Heuwirtschaft</b>											
Share of farms with hay drying systems to >90% by 2030.	Information and advice to farms on hay drying systems	ARGE Heumilch, Chamber of Agriculture	Initial advice for hay-milk farms on investments in hay-drying systems is provided	x	x	x	x	x	x	>90%	€ 50.000
			Annually 1 seminar on hay drying systems	1	1	1	1	1	1		€ 7.000

75% of hay-milk farms have photovoltaic systems or comparable renewable energies for hay drying by 2035	Information and advice for businesses on photovoltaics and comparable renewable energies	ARGE Heumilch	Informing hay-milk farmers about the advantages of renewable energy (especially PV)	x	1	1	1	1	1	1	€ 2.000
		ARGE Heumilch, Federal and state politics	Political decision-makers at the federal and state levels are persuaded to expand funding in this area	x	x	x	x	x	x	75%	
<b>Social sustainability through haymaking</b>											
A maximum of 10% of hay-milk farms will be phased out by 2030.	Training and information of hay-milk farmers, especially young farmers	ARGE Heumilch	Highlighting the opportunities for the hay industry in the volatile dairy market in its own communication media	x	x	x	x	x	x	x	€ 7.000
			Strengthening the self-confidence of the young generation through "hay-milk ambassadors", events and positive role models	x	x	x	x	x	x	x	€ 10.000

## APPENDIX

### 1. Hay milk regulation of ARGE Heumilch Österreich

#### Hay milk regulation of ARGE Heumilch Österreich Regulations for silo-free milk



##### Definition of hay milk

- Hay milk is milk from dams (cow, sheep, goat) produced by milk producers who comply with the criteria of the Austrian Environmental Program (the Austrian Agri-environmental Programme measure "no silage"), compliance with the Austrian hay milk regulation as well as compliance with the Implementing Regulation (EU) No. 304/2016 TSG Hay Milk, the Implementing Regulation (EU) No. 486/2019 for TSG sheep's hay milk as well as the Implementing Regulation (EU) No. 487/2019 for TSG goat's hay milk.
- Mountain/Alpine milk is hay milk if the criteria of the Austrian Agri-environmental Programme measure "Alpung und Behirtung" (Alpine grazing and herding) and the hay milk regulation are met on the mountain/alpine pasture.
- Organic hay milk also requires compliance with EU Organic Regulation 834/2007, as amended.
- AMA Quality Seal Guideline, Husbandry of Cows as amended or Sheep and Goat Husbandry as amended.
- Austrian Food Code: Guideline for the definition of "GMO-free production" of foodstuffs and their labelling as amended.
- Hay milk is produced through species-appropriate feeding. The health and well-being of the animals are essential elements of hay milk farming.

##### Hay milk farming

- To preserve the traditional basis of hay milk, no animals or feed may be used which must be labelled as genetically modified according to current legislation.
- The entire farm must be managed according to the rules of hay milk production.
- No production and feeding of silage on all premises of a hay milk producer. It is also illegal to sell directly from the field.
- No production and storage of round bales of any kind in film. Sale directly from the field is only permitted as hay.
- No production and feeding of wet hay or fermented hay on any farm of a hay milk producer.

##### Permitted feed

- Animals are fed mainly with fresh grasses and herbs during the green forage period and hay during the winter forage period.
- Supplemental roughage also includes green canola, green corn, green rye, and fodder beets, as well as hay, alfalfa, and corn pellets and similar feeds.
- Wheat, barley, oats, triticale, rye and corn in standard market form, e.g. bran, pellets, etc. are permitted.

- Field beans, forage peas, lupine, oilseeds and extraction meal or cake may be used in the feed ration.
- The proportion of roughage in the annual ration must be at least. 75% of the dry matter.

### **Prohibited feed**

- Do not feed silage (fermented feed), wet hay or fermented hay.
- No feeding of by-products from breweries, distilleries, cideries, and other residues from the food industry such as wet brewers grains or wet cuts - Exception: dry cuttings as a by-product of sugar production and protein feed from grain processing in the dry state, as well as grape marc in the dried state as a supplement in mineral mixtures.
- No feeding of soaked feed to dams.
- No feeding of feed of animal origin (milk, whey, animal meal, etc.), with the exception of milk and whey for young cattle.
- Do not feed garden and fruit waste, potatoes and urea.
- No feeding of feed produced outside of Europe.

### **Fertilisation regulations**

- No application of sewage sludge, sewage sludge products from municipal treatment plants to any agricultural land of the milk supplier.
- Adherence to a minimum waiting period of 3 weeks between the application of farm manure and use on all forage areas of the dairy supplier.
- Compost with green cuttings, shrub cuttings and organic waste can be applied if the compost producer participates in a quality assurance system and is certified. A minimum of compost quality A is a prerequisite.
- The use of biogas slurry is only permitted if it complies with the requirements of the Fertilizer Ordinance as amended for the raw materials of biogas slurry as fertiliser.

### **Use of chemical additives**

- Only selective use of chemical synthetic pesticides is possible under expert guidance of agricultural advisors and spot control on all forage areas of the milk supplier.
- Use of approved sprays for fly control is permitted in dairy barns only when dams are absent.

### **Animal welfare**

- Membership of the Animal Health Service (TGD) is mandatory.
- Dehorning of calves is allowed only after effective anesthesia and analgesia.
- Tail docking of calves is prohibited.
- A lying area is available for each dam.
- The cubicle and lying area are provided with straw bedding. This can be omitted if there is a soft bed. The solids of the manure separation are not permitted as bedding.
- Combination husbandry: in case of tethering, 120 days of outdoor exercise and or pasture/Alpine grazing are mandatory; permanent tethering (365d/24h) is prohibited.

### **Supply bans**

- Delivery after calving at the earliest on the 10th day after calving has successfully taken place.

- When using cows that have been fed silage (fermented feed), a waiting period of at least 14 days must be observed.
- Pasture/Alpine animals that were fed silage on the home farm must either be converted to silage-free feeding 14 days before the start of the pasture/Alpine season or the milk can only be used as hay milk after 14 days on the pasture/Alpine pasture. Silage may neither be produced nor fed on the Alpine pasture.





## 2. Cattle breeds of hay farming

Type of use	Breed
Meat breed	Agnus
Meat breed	Blonde d'Aquitaine
Meat breed	Charolais
Meat breed	Galloway
Meat breed	Limousin
Meat breed	Scottish Highland Cattle
Meat breed	Belgian White-Blue
Endangered breed	Ennstaler Bergscheck
Endangered breed	Carinthian Blondvieh
Endangered breed	Original Braunvieh
Endangered breed	Original Pinzgauer
Endangered breed	Pustertaler Sprinzen
Endangered breed	Tux Zillertal
Endangered breed	Hungarian Steppe cattle
Endangered breed	Waldviertel Blondvieh
Milk production	Braunvieh
Milk production	Fleckvieh
Milk production	Holstein-Friesian
Milk production	Jersey
Milk production	Tyrolean Grey cattle
Milk production	Pinzgauer

### 3. Grasses and herbs in hay milk meadows

Latin name	English name	Soil moisture		
<i>Achillea aspleniifolia</i>	Fern-leaf yarrow	Yellow		
<i>Achillea collina</i> (s. lat.)	Hill yarrow	Red		
<i>Achillea millefolium</i> (s. str.)	Yarrow	Green		
<i>Achillea moschata</i>	Musk yarrow	Green		
<i>Achillea pannonica</i>	Pannonian real yarrow	Red		
<i>Achillea pratensis</i>	Meadow True Yarrow	Green	Yellow	
<i>Achillea roseoalba</i>	Southern Alps yarrow	Green	Yellow	
<i>Aconitum napellus</i> s. str.	Blue monkshood	Green		
<i>Adenophora liliifolia</i>	Lily cup bell	Yellow	Blue	
<i>Adonis vernalis</i>	Spring Adonis Rose	Red		
<i>Aegopodium podagraria</i>	Goat's Foot	Green	Yellow	
<i>Agrimonia eupatoria</i>	Common agrimony	Red		
<i>Agrimonia procera</i>	Fragrant agrimony	Yellow		
<i>Agrostis alpina</i>	Alpine bunchgrass	Yellow	Green	
<i>Agrostis canina</i>	Dog Ostrich Grass	Yellow	Blue	
<i>Agrostis gigantea</i>	Giant bunchgrass	Green		
<i>Agrostis rupestris</i>	Rock bunchgrass	Yellow	Green	
<i>Agrostis stolonifera</i>	Creeping bunchgrass	Yellow		
<i>Agrostis vinealis</i>	Heather bunchgrass	Yellow		
<i>Ajuga genevensis</i>	Shaggy bugle	Red		
<i>Ajuga pyramidalis</i>	Pyramid Gooseberry	Green		
<i>Ajuga reptans</i>	Creeping goutweed	Green		
<i>Alchemilla acutiloba</i>	Pointe woman mantle	Green	Yellow	
<i>Alchemilla alpina</i>	Alpine Silver Coat	Green		
<i>Alchemilla connivens</i>	Grassland lady's mantle	Yellow	Green	Red
<i>Alchemilla coriacea</i>	Leather leaf woman coat	Blue		
<i>Alchemilla crinita</i>	Long hair woman mantle	Green	Yellow	
<i>Alchemilla exigua</i>	Weak lady's mantle	Green		
<i>Alchemilla flabellata</i>	Fan woman coat	Red		
<i>Alchemilla glabra</i>	Bald woman's mantle	Yellow	Blue	
<i>Alchemilla glaucescens</i>	Felt woman coat	Green		
<i>Alchemilla micans</i>	Petite woman mantle	Yellow		
<i>Alchemilla monticola</i>	Mountain Meadow Lady's Mantle	Green		
<i>Alchemilla nitida</i>	Shiny silver coat	Green		
<i>Alchemilla plicata</i>	Wrinkles woman mantle	Red		
<i>Alchemilla straminea</i>	Straw woman mantle	Blue		
<i>Alchemilla subcrenata</i>	Notched Tooth Lady's Mantle	Green	Yellow	
<i>Alchemilla xanthochlora</i>	Yellow green woman mantle	Green	Yellow	
<i>Allium angulosum</i>	Edge leeks	Yellow		
<i>Allium carinatum</i>	Actual keel leek	Red	Green	Yellow
<i>Allium carinatum</i>	Beautiful keel leek	Red		
<i>Allium flavum</i>	Yellow leek	Red		
<i>Allium lusitanicum</i>	Mountain Leek	Red		
<i>Allium oleraceum</i>	Bell leeks	Red	Green	Yellow
<i>Allium rotundum</i>	Round leek	Red		
<i>Allium schoenoprasum</i>	Cut leeks	Yellow	Blue	
<i>Allium sphaerocephalon</i>	Ball leek	Red		
<i>Allium victorialis</i>	Allermann armor	Green		
<i>Allium vineale</i>	Vineyard Leeks	Red		

<i>Alopecurus geniculatus</i>	Bent foxtail grass			
<i>Alopecurus pratensis</i>	Meadow foxtail grass			
<i>Alyssum alyssoides</i>	Goblet Stonecrop			
<i>Anacamptis coriophora</i> (subsp. <i>coriophora</i> )	Bug orchid			
<i>Anacamptis morio</i>	Lesser marsh orchid			
<i>Anacamptis pyramidalis</i>	Pyramid Dogbane			
<i>Anemonastrum narcissiflorum</i>	Mountain Chicken			
<i>Anemone nemorosa</i>	Bush anemone			
<i>Anemone sylvestris</i>	Greater Anemone			
<i>Anemone trifolia</i>	Three-leaved anemone			
<i>Angelica sylvestris</i>	Wild angelica			
<i>Antennaria dioica</i>	Common cat paw			
<i>Anthemis tinctoria</i> (s. str.)	Dyer Dog Chamomile			
<i>Anthericum liliago</i>	Branchless fence lily			
<i>Anthericum ramosum</i>	Bough fence lily			
<i>Anthoxanthum alpinum</i>	Alpine Creeping Ryegrass			
<i>Anthoxanthum odoratum</i>	Common bentgrass			
<i>Anthriscus nitidus</i>	Glossy chervil			
<i>Anthriscus sylvestris</i> (s. str.)	Meadow chervil			
<i>Anthyllis vulneraria</i>	Alpine woundwort			
<i>Anthyllis vulneraria</i>	Carried over wound clover			
<i>Anthyllis vulneraria</i>	Carpathian Wound Clover			
<i>Anthyllis vulneraria</i>	Steppe Wound Clover			
<i>Aquilegia vulgaris</i>	Common columbine			
<i>Arabidopsis halleri</i>	Creeping foam cress			
<i>Arabidopsis thaliana</i>	Field cress			
<i>Arabis ciliata</i>	Pre-Alpine Goose Cress			
<i>Arabis hirsuta</i> (s. str.)	Rough-haired goosegrass			
<i>Arabis nova</i>	Rock Goose Cress			
<i>Arabis sagittata</i>	Arrow Goose Cress			
<i>Arctostaphylos alpinus</i>	Alpine bearberry			
<i>Arctostaphylos uva-ursi</i>	Real bearberry			
<i>Arenaria leptoclados</i>	Delicate sandwort			
<i>Arenaria procera</i>	Grass Leaf Sandwort			
<i>Arenaria serpyllifolia</i>	Quender sandwort			
<i>Armeria alpina</i> (s. str.)	Alpine grass carnation			
<i>Armeria elongata</i>	Sand-grass carnation			
<i>Armoracia rusticana</i>	Horseradish, horseradish			
<i>Arnica montana</i>	Arnika			
<i>Arrhenatherum elatius</i>	Glatthafer			
<i>Artemisia absinthium</i>	Real wormwood			
<i>Artemisia campestris</i> (s. str.)	Field Mugwort			
<i>Artemisia pontica</i>	Pontsch Wormwood			
<i>Asparagus officinalis</i>	Garden asparagus			
<i>Asperula cynanchica</i> (s. str.)	Squinancywort			
<i>Asperula tinctoria</i>	Dryer's woodruff			
<i>Aster alpinus</i>	Alpine Aster			
<i>Aster amellus</i>	Mountain Aster			
<i>Astragalus alpinus</i>	Alpine Tragacanth			
<i>Astragalus austriacus</i>	Austria-Tragant			
<i>Astragalus cicer</i>	Giggle Tragacanth			
<i>Astragalus frigidus</i>	Cold tragacanth			

<i>Astragalus leontinus</i>	Tyrolean tragacanth			
<i>Astragalus norvegicus</i>	Norway Tragacanth			
<i>Astragalus onobrychis</i>	Sainfoin tragacanth			
<i>Astragalus penduliflorus</i>	Pendulous tragacanth			
<i>Astrantia major</i>	Große Sterndolde			
<i>Avenula adsurgens</i>	True Rising Meadow Oats			
<i>Avenula adsurgens</i>	South Tyrolean Rising Meadow Oats			
<i>Avenula praeusta</i>	Alpine Meadow Oats			
<i>Avenula pratensis</i>	Bald meadow oat			
<i>Avenula versicolor</i> (subsp. <i>versicolor</i> )	Bunthafer			
<i>Bartsia alpina</i>	Alpine helmet			
<i>Bellidiastrum michelii</i>	Alpenmaßliebchen			
<i>Bellis perennis</i>	Common daisy			
<i>Berberis vulgaris</i>	Common barberry			
<i>Betonica alopecuroides</i>	Yellow concrete			
<i>Betonica officinalis</i> (subsp. <i>officinalis</i> )	Real concrete			
<i>Biscutella laevigata</i>	Smooth eyeglass cap			
<i>Blysmus compressus</i>	Source binary			
<i>Bothriochloa ischaemum</i>	Bartgras			
<i>Botrychium lanceolatum</i> (subsp. <i>lanceolatum</i> )	Lancet moonwort			
<i>Botrychium lunaria</i>	Common moon rue			
<i>Botrychium matricariifolium</i>	Boughy moon rue			
<i>Botrychium multifidum</i>	Multicolored moon rue			
<i>Botrychium simplex</i>	Simple moon rue			
<i>Brachypodium pinnatum</i>	Heath false brome			
<i>Brachypodium rupestre</i>	Tor-grass			
<i>Briza media</i>	Common quaking grass			
<i>Bromus commutatus</i>	Mixed up trespe			
<i>Bromus condensatus</i> (subsp. <i>microtrichus</i> )	Dense flowered trespe			
<i>Bromus erectus</i>	Upright trespe			
<i>Bromus hordeaceus</i>	Soft trespe			
<i>Bromus inermis</i>	Defenseless trespe			
<i>Bromus racemosus</i> (s. str.)	Knotted trespe			
<i>Buphthalmum salicifolium</i>	Genuine ox eye			
<i>Bupleurum falcatum</i> (subsp. <i>falcatum</i> )	Sickle Rabbit Ear			
<i>Bupleurum longifolium</i> (subsp. <i>vapincense</i> )	Long-leaved rabbit ear			
<i>Calluna vulgaris</i>	Broomheather			
<i>Caltha palustris</i>	Common marsh marigold			
<i>Campanula alpina</i>	Alpine bellflower			
<i>Campanula barbata</i>	Bearded bellflower			
<i>Campanula bononiensis</i>	Felt bell flower			
<i>Campanula cervicaria</i>	Bristle bellflower			
<i>Campanula glomerata</i>	Tangle bellflower			
<i>Campanula patula</i>	Meadow bellflower			
<i>Campanula rotundifolia</i>	Round-leaved bellflower			
<i>Campanula scheuchzeri</i>	Scheuchzer bellflower			
<i>Campanula thyrsoidea</i>	Ostrich bellflower			
<i>Campanula witasekiana</i>	Witasek bellflower			
<i>Capsella bursa-pastoris</i>	Common shepherd's purse			
<i>Cardamine dentata</i>	Toothleaf Meadow Foamwort			
<i>Cardamine matthioli</i>	White meadow foamwort			
<i>Cardamine pratensis</i> (s. str.)	Common meadow foamwort			
<i>Cardamine rivularis</i>	Mountain Meadow Foamwort			

<i>Carduus defloratus</i> s. lat.	Alpine thistle			
<i>Carduus nutans</i>	Nodding ring thistle			
<i>Carex aterrima</i>	Cabbage black sedge			
<i>Carex atrata</i>	Black sedge			
<i>Carex bicolor</i>	Bicolor sedge			
<i>Carex brizoides</i>	Seaweed Sedge			
<i>Carex brunnescens</i>	Common Brown Sedge			
<i>Carex buxbaumii</i>	Buxbaum Sedge			
<i>Carex canescens</i> (subsp. <i>canescens</i> )	Gray Sedge			
<i>Carex capillaris</i>	Hairpin Sedge			
<i>Carex caryophyllea</i>	Spring Sedge			
<i>Carex curvula</i>	Crooked sedge			
<i>Carex distans</i>	Remote sedge			
<i>Carex echinata</i>	Hedgehog Sedge			
<i>Carex ericetorum</i>	Heath Sedge			
<i>Carex ferruginea</i>	Rust Sedge			
<i>Carex firma</i>	Cushion Sedge			
<i>Carex flacca</i> (subsp. <i>flacca</i> )	Blue green sedge			
<i>Carex flava</i>	Great yellow sedge			
<i>Carex frigida</i>	Ice Sedge			
<i>Carex hartmanii</i>	Hartmann's Sedge			
<i>Carex hirta</i>	Hairy sedge			
<i>Carex hostiana</i>	Hem Sedge			
<i>Carex humilis</i>	Earth Sedge			
<i>Carex lepidocarpa</i>	Medium yellow sedge			
<i>Carex leporina</i>	Rabbit Sedge			
<i>Carex liparocarpos</i>	Glossy sedge			
<i>Carex michelii</i>	Micheli Sedge			
<i>Carex montana</i>	Mountain Sedge			
<i>Carex mucronata</i>	Spiky sedge			
<i>Carex nigra</i>	Brown Sedge			
<i>Carex oederi</i>	Small yellow sedge			
<i>Carex ornithopoda</i>	Bird's-foot Sedge			
<i>Carex otrubae</i>	Hain sedge			
<i>Carex pallescens</i>	Pale Sedge			
<i>Carex panicea</i>	Millet Sedge			
<i>Carex paniculata</i>	Panicle Sedge			
<i>Carex pilulifera</i>	Pill Sedge			
<i>Carex praecox</i>	Early Sedge			
<i>Carex riparia</i>	Bank Sedge			
<i>Carex sempervirens</i> (subsp. <i>sempervirens</i> )	Horst Sedge			
<i>Carex tomentosa</i>	Felt sedge			
<i>Carex tumidicarpa</i>	Misunderstood yellow sedge			
<i>Carex umbrosa</i>	Shadow Sedge			
<i>Carex vulpina</i>	Fox Sedge			
<i>Carex vulpinoidea</i>	False Fox Sedge			
<i>Carlina acaulis</i>	Silver Thistle			
<i>Carlina biebersteinii</i>	Long-leaved golden thistle			
<i>Carlina vulgaris</i>	Common golden thistle			
<i>Carum carvi</i>	Real caraway			
<i>Centaurea jacea</i>	Fiddlestick meadow knapweed			
<i>Centaurea jacea</i>	Light scaled meadow knapweed			

<i>Centaurea jacea</i>	Crested scaly meadow knapweed			
<i>Centaurea jacea</i>	Common meadow knapweed			
<i>Centaurea jacea</i>	Narrow-leaved meadow knapweed			
<i>Centaurea nigrescens</i>	Blackish knapweed			
<i>Centaurea pseudophrygia</i>	Wig flake flower			
<i>Centaurea scabiosa</i>	Scabiosa knapweed			
<i>Centaurea stoebe</i>	Rhineland knapweed			
<i>Cerastium arvense</i>	Common Field Hornwort			
<i>Cerastium arvense</i>	Stiff field hornwort			
<i>Cerastium arvense</i>	Woody field hornwort			
<i>Cerastium brachypetalum</i> (s. str.)	Small flowered hornwort			
<i>Cerastium glutinosum</i>	Sticky hornwort			
<i>Cerastium holosteoides</i>	Common hornwort			
<i>Cerastium pumilum</i>	Low hornwort			
<i>Cerastium semidecandrum</i>	Sand-hornwort			
<i>Cerastium tenoreanum</i>	Tenore hornwort			
<i>Cervaria rivini</i>	Deerroot			
<i>Chaerophyllum aureum</i>	Gold calf crop			
<i>Chaerophyllum hirsutum</i> (s. str.)	Eyelash calf crop			
<i>Chaerophyllum villarsii</i>	Alpine calf crop			
<i>Chamaecytisus austriacus</i>	Austria dwarf goat's clover			
<i>Chamaecytisus ratisbonensis</i>	Regensburg Dwarf Goat Clover			
<i>Chamorchis alpina</i>	Dwarf stand			
<i>Chenopodium bonus-henricus</i>	Good Henry			
<i>Chondrilla juncea</i>	Rod Knotted Lettuce			
<i>Cirsium acaule</i>	Earth Thistle			
<i>Cirsium arvense</i>	Field Thistle			
<i>Cirsium heterophyllum</i>	Felt Thistle			
<i>Cirsium oleraceum</i>	Cabbage Thistle			
<i>Cirsium palustre</i>	Marsh Thistle			
<i>Cirsium pannonicum</i>	Hungarian thistle			
<i>Cirsium rivulare</i>	Brook Thistle			
<i>Cirsium spinosissimum</i>	Alpine Thistle			
<i>Cirsium tuberosum</i>	Thistle			
<i>Cirsium vulgare</i>	Spear Thistle			
<i>Clinopodium acinos</i>	Common stonecrop			
<i>Clinopodium alpinum</i> (subsp. alpinum)	Alpine Stonecrop			
<i>Clinopodium vulgare</i> (subsp. vulgare)	Whirligig			
<i>Coeloglossum viride</i>	Green Hollow Tongue			
<i>Colchicum autumnale</i>	Common autumn crocus			
<i>Coronilla coronata</i>	Mountain Crown Vetch			
<i>Coronilla vaginalis</i>	Sheath Crown Vetch			
<i>Corydalis cava</i>	Hollow larkspur			
<i>Corydalis intermedia</i>	Medium larkspur			
<i>Crataegus laevigata</i> agg.	Two-core Hawthorn			
<i>Crataegus monogyna</i> agg.	Mesh hawthorn			
<i>Crepis alpestris</i>	Pre-Alpine Pippa			
<i>Crepis aurea</i>	Gold Pippa			
<i>Crepis biennis</i>	Meadow Pippa			
<i>Crepis capillaris</i>	Hairy-stemmed Pippa			
<i>Crepis conyzifolia</i>	Large-headed Pippa			
<i>Crepis mollis</i>	Soft haired pippa			
<i>Crepis paludosa</i>	Marsh Pippa			

<i>Crepis pontana</i>	Mountain Pippa	Green		
<i>Crepis praemorsa</i>	Grape Pippa	Green		
<i>Crocus albiflorus</i>	Alpine Crocus	Green	Yellow	
<i>Crocus exiguus</i>	Illyrian crocus	Green	Yellow	
<i>Crocus purpureus</i>	Naples Crocus	Green	Yellow	
<i>Cruciata glabra</i>	Bald ragwort	Green		
<i>Cruciata laevipes</i>	Common ragwort	Green		
<i>Cuscuta epithymum</i>	Quendel devil's twine	Red		
<i>Cyanus triumfettii</i>	Colorful knapweed	Red		
<i>Cynosurus cristatus</i>	Common crested wheatgrass	Green	Yellow	
<i>Cypripedium calceolus</i>	Lady's slipper	Red		
<i>Dactylis glomerata</i>	Meadow knapweed	Green		
<i>Dactylis glomerata</i>	Reichenbach knotgrass	Red		
<i>Dactylis polygama</i>	Forest knotgrass	Green		
<i>Dactylorhiza cruenta</i>	Blood Red Fleshy Fingerroot	Blue	Yellow	
<i>Dactylorhiza incarnata</i>	Actual flesh fingerroot	Blue	Yellow	
<i>Dactylorhiza maculata s. lat.</i>	Spotted Fingerroot	Green	Yellow	
<i>Dactylorhiza majalis</i>	Broadleaf Fingerroot	Blue	Yellow	
<i>Dactylorhiza sambucina</i>	Elderberry fingerroot	Green	Red	
<i>Dactylorhiza traunsteineri</i>	Traunsteiner fingerroot	Blue	Yellow	
<i>Danthonia decumbens</i>	Lying three tooth grass	Red	Green	
<i>Daucus carota</i>	Wild carrot	Red		
<i>Deschampsia cespitosa</i>	Common turfgrass	Yellow	Green	
<i>Dianthus alpinus</i>	Alpine pink	Green		
<i>Dianthus armeria</i> (subsp. <i>armeria</i> )	Tufted carnation	Red		
<i>Dianthus barbatus</i>	Bearded Carnation	Red		
<i>Dianthus carthusianorum</i>	Carthusian carnation	Red		
<i>Dianthus deltoides</i>	Heather Carnation	Red		
<i>Dianthus glacialis</i> (subsp. <i>glacialis</i> )	Glacier Carnation	Green		
<i>Dianthus pontederiae</i>	Pannonian Carthusian Carnation	Red		
<i>Dianthus sternbergii</i>	Dolomite Carnation	Red		
<i>Dianthus superbus</i>	Large flowered magnificent carnation	Green		
<i>Dianthus superbus</i>	Wet meadows magnificent carnation	Green		
<i>Dianthus sylvestris</i> (subsp. <i>sylvestris</i> )	Wild carnation	Red		
<i>Draba boerhavia</i>	Round fruit hunger flower	Red		
<i>Draba nemorosa</i>	Bush Rockflower	Red	Green	
<i>Draba praecox</i>	Early hunger flower	Red		
<i>Draba verna s. str.</i>	Common hungry flower	Red		
<i>Dracocephalum ruyschiana</i>	Nordic scorpion fish	Red		
<i>Drymocallis rupestris</i>	Rock cinquefoil	Red		
<i>Elymus hispidus</i>	Blue-quill	Red		
<i>Elymus repens</i>	Field quackgrass	Green		
<i>Empetrum hermaphroditum</i>	Hermaphrodite crowberry	Green		
<i>Epilobium parviflorum</i>	Downy Willowherb	Yellow		
<i>Epipactis atrorubens</i>	Dark-red helleborine	Red		
<i>Epipactis palustris</i>	Swamp stonewort	Yellow	Blue	
<i>Equisetum arvense</i>	Field Horsetail	Green		
<i>Equisetum palustre</i>	Marsh Horsetail	Blue		
<i>Erica carnea</i>	Snow heath, Erika	Red		
<i>Erigeron acris</i>	Bitter fleabane	Red		
<i>Erigeron alpinus</i> (s. str.)	Alpine fleabane	Green	Red	
<i>Erigeron annuus</i>	Annual fleabane	Green	Red	

Erigeron atticus	Greek fleabane	Green		
Erigeron canadensis	Canadian fleabane	Green	Red	
Erigeron glabratus	Variable fleabane	Green	Red	
Erigeron neglectus	Neglected fleabane	Green	Red	
Eryngium campestre	Field Man Litter	Red		
Erysimum odoratum	Pannonian gold varnish	Red		
Erythronium dens-canis	Dogtooth	Green		
Euphorbia carniolica	Krainer spurge	Green		
Euphorbia cyparissias	Cypress spurge	Red		
Euphorbia palustris	Swamp spurge	Yellow		
Euphorbia polychroma	Variiegated spurge	Red		
Euphorbia verrucosa	Warty spurge	Green		
Euphorbia villosa (s. str.)	Downy Spurge	Yellow		
Euphorbia virgata	Rod spurge	Red		
Euphrasia cuspidata	Carniola Eyebright	Red		
Euphrasia kernerii	Kerner Eyebright	Yellow		
Euphrasia minima s. str.	Dwarf Eyebright	Green		
Euphrasia officinalis	Common Meadow Eyebright	Yellow		
Euphrasia stricta	Stiff eyebright	Red		
Falcaria vulgaris	Crescent	Red		
Festuca "guestfalica" (sensu Fl. Eur. p. p., typo excl.)	Hard sheep fescue	Red		
Festuca arundinacea	Cane fescue	Yellow		
Festuca brevipila s. lat.	Rough-leaf fescue	Red		
Festuca filiformis	Thread sheep fescue	Red		
Festuca heteromalla	Many-flowered red fescue	Green		
Festuca nigrescens	Horst Red Fescue	Green		
Festuca nigricans	Blackish violet fescue	Green		
Festuca norica	Noric violet fescue	Green	Red	
Festuca ovina s. str.	Actual sheep fescue	Red		
Festuca pallens	Pale Sheep Fescue	Red		
Festuca paniculata	Gold fescue	Green	Red	
Festuca picturata	Variiegated violet fescue	Green		
Festuca pratensis s. str.	Meadow fescue	Green		
Festuca pseudovina	Salt Fescue	Red		
Festuca pulchella	Ornamental fescue	Green	Yellow	
Festuca pumila	Dwarf Fescue	Green	Red	
Festuca rubra	Foothill red fescue	Green		
Festuca rupicola	Actual furrow fescue	Red		
Festuca supina	Small sheep fescue	Red		
Festuca trichophylla	Hairy-leaf red fescue	Green		
Festuca valesiaca s. str.	Wallis fescue	Red		
Ficaria verna (subsp. verna)	Spring lesser celandine	Green		
Filago lutescens	Yellow felt weed	Red		
Filago minima	Dwarf felt weed	Red		
Filago vulgaris	German felt weed	Red		
Filipendula ulmaria	True meadowsweet	Yellow	Green	
Filipendula vulgaris	Tuberous Meadowsweet	Green	Red	
Fragaria viridis	Crisp Strawberry	Red		
Frangula alnus	Common sloth tree	Yellow	Green	Red
Fumana procumbens	Lying anemone	Red		
Gagea liotardii	Tubular yellowberry	Green		
Gagea pratensis	Meadow yellowberry	Red		



<i>Gagea pusilla</i>	Small yellow star			
<i>Galatella linosyris</i>	Goldaster			
<i>Galium album</i> s. str.	Big meadow ragwort			
<i>Galium anisophyllum</i>	Alpine ragwort			
<i>Galium boreale</i> (s.str.)	Nordic bedstraw			
<i>Galium glaucum</i> s. str.	Common blue-green ragwort			
<i>Galium lucidum</i> (s. str.)	Glossy cabbage			
<i>Galium mollugo</i> (s. str.)	Small meadow ragwort			
<i>Galium noricum</i>	Noric cabbage			
<i>Galium palustre</i> (s. str.)	Swamp ragwort			
<i>Galium pumilum</i>	Heather ragwort			
<i>Galium pycnotrichum</i>	Thick meadow ragwort			
<i>Galium saxatile</i>	Resin ragwort			
<i>Galium verum</i> (s. str.)	True bedstraw			
<i>Galium wirtgenii</i>	Wirtgen ragwort			
<i>Genista germanica</i>	German broom			
<i>Genista pilosa</i>	Heide-Ginster			
<i>Genista sagittalis</i>	Wing broom			
<i>Genista tinctoria</i>	Dyer broom			
<i>Gentiana acaulis</i>	Stemless gentian			
<i>Gentiana asclepiadea</i>	Swallow-wort gentian			
<i>Gentiana bavarica</i> (s. str.)	Bavarian gentian			
<i>Gentiana clusii</i> (subsp. clusii)	Clusius-Enzian			
<i>Gentiana cruciata</i>	Kreuz-Enzian			
<i>Gentiana lutea</i>	Yellow gentian			
<i>Gentiana nivalis</i>	Snow Gentian			
<i>Gentiana orbicularis</i>	Round-leaved gentian			
<i>Gentiana pannonica</i>	Ostalpen-Enzian			
<i>Gentiana pneumonanthe</i>	Lung gentian			
<i>Gentiana prostrata</i>	Lying gentian			
<i>Gentiana punctata</i>	Spotted Gentian			
<i>Gentiana purpurea</i>	Purpur-Enzian			
<i>Gentiana utriculosa</i>	Hose gentian			
<i>Gentiana verna</i> (s. str.)	Spring gentian			
<i>Gentianella anisodonta</i>	Calyx Cranberry			
<i>Gentianella aspera</i>	Rough wreath gentian			
<i>Gentianella campestris</i>	Field Cranberry			
<i>Gentianella rhaetica</i>	Rhaetian cranberry			
<i>Gentianopsis ciliata</i>	Common fringed gentian			
<i>Geranium divaricatum</i>	Spreading cranesbill			
<i>Geranium molle</i> (s. str.)	Soft cranesbill			
<i>Geranium palustre</i>	Marsh Cranesbill			
<i>Geranium phaeum</i>	Pale purple cranesbill			
<i>Geranium pratense</i>	Meadow Cranesbill			
<i>Geranium pyrenaicum</i>	Pyrenean Cranesbill			
<i>Geranium sanguineum</i>	Blood Cranesbill			
<i>Geranium sylvaticum</i>	Wood Cranesbill			
<i>Geum montanum</i>	Mountain carnation root			
<i>Geum rivale</i>	Brook carnation root			
<i>Gladiolus palustris</i>	Marsh Periwinkle			
<i>Glechoma hederacea</i>	Common ground ivy			
<i>Globularia bisnagarica</i>	High stem globe flower			

<i>Globularia cordifolia</i>	Heartleaf globe flower			
<i>Globularia nudicaulis</i>	Bare stem globe flower			
<i>Glyceria declinata</i>	Inclined swath grass			
<i>Glyceria fluitans</i>	Flooding swath grass			
<i>Glyceria striata</i>	Striped swath grass			
<i>Gnaphalium norvegicum</i>	Norwegian dysentery			
<i>Gnaphalium sylvaticum</i>	Forest clockwort			
<i>Gnaphalium uliginosum</i>	Swamp Duckweed			
<i>Gymnadenia conopsea</i> (s. lat)	Long spurred knapweed			
<i>Gymnadenia odoratissima</i>	Perfumed hellebore			
<i>Hedysarum hedysaroides</i>	Alpine Sweet Clover			
<i>Helianthemum alpestre</i> s. str.	Alpine sunflower			
<i>Helianthemum canum</i>	Gray sunflower			
<i>Helianthemum nummularium</i>	Bald sunflower			
<i>Helianthemum nummularium</i>	Bicolor sunflower			
<i>Helianthemum nummularium</i>	Cloudy green sunflower			
<i>Helianthemum nummularium</i>	Large flowered sunflower			
<i>Helleborus dumetorum</i> (subsp. <i>dumetorum</i> )	Hedge hellebore			
<i>Heracleum sphondylium</i>	Mountain Meadow Hogweed			
<i>Heracleum sphondylium</i>	Actual meadow hogweed			
<i>Herminium monorchis</i>	Honey unicorn			
<i>Hieracium alpinum</i> (s. lat.)	Alpine Hawkweed			
<i>Hieracium angustifolium</i>	Glacial mouse-ear hawkweed			
<i>Hieracium aurantiacum</i>	Orange mouse-ear hawkweed			
<i>Hieracium bauhini</i>	Bauhin mouse-ear hawkweed			
<i>Hieracium bifidum</i>	Fork-hawkweed			
<i>Hieracium caespitosum</i>	Meadow mouse-ear hawkweed			
<i>Hieracium cymosum</i>	Cloud mouse-ear hawkweed			
<i>Hieracium floribundum</i>	Rich flower mouse-ear hawkweed			
<i>Hieracium glanduliferum</i>	Gray Scots Hawkweed			
<i>Hieracium guthnickianum</i> s. str.	Guthnik's mouse-ear hawkweed			
<i>Hieracium hoppeanum</i>	Hoppe Mouse-ear Hawkweed			
<i>Hieracium lactucella</i>	Mouse-ear Hawkweed			
<i>Hieracium maculatum</i>	Spotted Hawkweed			
<i>Hieracium murorum</i>	Forest Hawkweed			
<i>Hieracium pilosella</i>	Lesser mouse-ear hawkweed			
<i>Hieracium pilosum</i>	Wool Basket Hawkweed			
<i>Hieracium praealtum</i>	Tall Florence Mouse-ear Hawkweed			
<i>Hieracium sparsiramum</i>	Weitast Hawkweed			
<i>Hieracium sphaerocephalum</i>	Round-headed mouse-ear hawkweed			
<i>Hieracium villosum</i>	Villous Hawkweed			
<i>Hippocrepis comosa</i>	Common horseshoe clover			
<i>Hippophae rhamnoides</i>	Sanddorn			
<i>Holcus lanatus</i>	Wooly honey grass			
<i>Holcus mollis</i>	Soft honey grass			
<i>Holosteum umbellatum</i>	Umbrella chute			
<i>Homalotrichon pubescens</i>	Downy Oats			
<i>Homogyne alpina</i>	Green brandy lettuce			
<i>Horminum pyrenaicum</i>	Dragon Mouth			
<i>Huperzia selago</i> (subsp. <i>selago</i> )	Fir Devil Claw			
<i>Hypericum dubium</i>	Stump St. John's wort			
<i>Hypericum humifusum</i>	Couch St. John's wort			
<i>Hypericum maculatum</i> (s. str.)	Spotted St. John's wort			

<i>Hypericum perforatum</i>	Real St. John's wort	Green	Red	
<i>Hypochoeris maculata</i>	Spotted piglet weed	Red		
<i>Hypochoeris radicata</i>	Common Piglet Weed	Green		
<i>Hypochoeris uniflora</i>	One-headed piglet weed	Green		
<i>Inula britannica</i>	Meadow Atlant	Yellow		
<i>Inula conyzae</i>	Duerrwort	Red		
<i>Inula ensifolia</i>	Sword Atlant	Red		
<i>Inula hirta</i>	Rough hair elecampane	Red		
<i>Inula oculus-christi</i>	Christ Eye Atlant	Red		
<i>Inula salicina</i>	Willow Atlant	Green	Yellow	
<i>Iris graminea</i>	Grass Iris	Red		
<i>Iris pumila</i>	Dwarf iris	Red		
<i>Iris sibirica</i>	Siberian iris	Yellow		
<i>Iris variegata</i>	Variegated iris	Red		
<i>Jasione montana</i>	Mountain Sand Button	Red		
<i>Juncus acutiflorus</i>	Pointed flowered cornices	Yellow		
<i>Juncus alpinoarticulatus</i>	Alpine Simse	Yellow		
<i>Juncus articulatus</i>	Limbs-Simse	Yellow		
<i>Juncus compressus</i>	Compressed ledges	Yellow	Blue	
<i>Juncus conglomeratus</i>	Tangle Siamese	Yellow		
<i>Juncus effusus</i>	Flutter Simse	Yellow		
<i>Juncus filiformis</i>	Thread Simse	Yellow		
<i>Juncus inflexus</i>	Gray ledges	Yellow		
<i>Juncus jacquinii</i>	Chamois Simms	Green		
<i>Juncus monanthos</i>	Single flower ledge	Green	Red	
<i>Juncus squarrosus</i>	Sparse ledges	Yellow	Blue	
<i>Juncus subnodulosus</i>	Knotted Siamese	Yellow		
<i>Juncus trifidus</i>	Trifoliate cornice	Green	Red	
<i>Juniperus communis</i>	Upright juniper	Green		
<i>Juniperus communis</i>	Dwarf juniper	Green		
<i>Jurinea mollis</i>	Soft silvershark	Red		
<i>Knautia arvensis</i> (s. str.)	Meadow Widowflower	Red		
<i>Knautia longifolia</i>	Long-leaved widow flower	Green		
<i>Koeleria hirsuta</i>	Rough crested wheatear	Red		
<i>Koeleria macrantha</i>	Tumbleweed	Red		
<i>Koeleria pyramidata</i>	Meadow ridgegrass	Red		
<i>Lactuca perennis</i>	Blue lettuce	Red		
<i>Lactuca viminea</i>	Rod lettuce	Red		
<i>Laserpitium halleri</i>	Haller's laser herb	Green		
<i>Laserpitium krapfii</i> (subsp. <i>gaudinii</i> )	Swiss Red-edged Laser Weed	Green		
<i>Laserpitium prutenicum</i>	Prussian laser herb	Yellow		
<i>Lathyrus laevigatus</i>	Yellow vetchling	Green		
<i>Lathyrus latifolius</i>	Winged pea	Red	Green	
<i>Lathyrus linifolius</i>	Mountain Chickpea	Red		
<i>Lathyrus nissolia</i>	Grass chickpea	Green		
<i>Lathyrus palustris</i>	Marsh pea	Yellow		
<i>Lathyrus pratensis</i>	Meadow vetchling	Green		
<i>Leontodon hispidus</i>	Common luminous tooth	Green	Yellow	
<i>Leontopodium alpinum</i> (subsp. <i>alpinum</i> )	Alpine Edelweiss	Green	Red	
<i>Leucanthemopsis alpina</i>	Alpine daisy	Yellow	Green	
<i>Leucanthemum adustum</i>	Burnt daisy	Green		
<i>Leucanthemum gaudinii</i>	Gaudin daisy	Green		

<i>Leucanthemum ircutianum</i>	Fat Meadow Daisy	Green		
<i>Leucanthemum vulgare</i> (s. str.)	Meadow daisy	Green	Red	
<i>Leucojum vernum</i>	Spring knot flower	Yellow	Blue	
<i>Lilium bulbiferum</i>	Fire Lily	Red		
<i>Lilium martagon</i>	Turk's Covenant Lily	Green		
<i>Limodorum abortivum</i>	Purple thingy	Red		
<i>Linaria genistifolia</i> (subsp. <i>genistifolia</i> )	Broom flax	Red		
<i>Linum alpinum</i>	Alpine Linen	Red		
<i>Linum austriacum</i> (subsp. <i>austriacum</i> )	Austrian flax	Red		
<i>Linum catharticum</i>	Purgier Linen	Yellow	Green	Red
<i>Linum flavum</i> (s. str.)	Yellow flax	Red		
<i>Linum tenuifolium</i>	Fine-leaved flax	Red		
<i>Linum viscosum</i>	Sticky flax	Green		
<i>Listera ovata</i>	Large two-leaf	Green		
<i>Lloydia serotina</i>	Late wrinkled lily	Green		
<i>Loiseleuria procumbens</i>	Gämsheide	Red	Green	
<i>Lolium xboucheanum</i>	Bastard-Lolch	Green		
<i>Lolium multiflorum</i>	Italy raygrass	Green		
<i>Lolium perenne</i>	English ryegrass	Green		
<i>Lomatogonium carinthiacum</i>	Carinthian hem scar	Yellow	Green	
<i>Lotus corniculatus</i> (s. str.)	Common horn clover	Yellow	Green	Red
<i>Lotus maritimus</i> (var. <i>siliquosus</i> )	Asparagus clover	Yellow	Blue	
<i>Lotus pedunculatus</i>	Swamp Horned Clover	Yellow		
<i>Lotus tenuis</i>	Salt Horn Clover	Yellow		
<i>Luzula alpina</i>	Alpen-Hainsimse	Green		
<i>Luzula alpinopilosa</i>	Braune Hainsimse	Yellow		
<i>Luzula campestris</i>	Hill Grove	Red	Green	
<i>Luzula glabrata</i>	Bald grove	Green		
<i>Luzula lutea</i>	Gold-Hainsimse	Green	Red	
<i>Luzula luzuloides</i>	White hairy cress	Green	Red	
<i>Luzula multiflora</i> s. str.	Many-flowered woodrush	Green		
<i>Luzula pilosa</i>	Wimper-Hainsimse	Green		
<i>Luzula spicata</i>	Spiky Hair Cone	Red		
<i>Luzula sudetica</i>	Sudeten-Hainsimse	Green		
<i>Lychnis flos-cuculi</i>	Cuckoo's light carnation	Yellow		
<i>Lythrum hyssopifolia</i>	Hyssop loosestrife	Blue		
<i>Lythrum salicaria</i>	Common loosestrife	Blue		
<i>Malva alcea</i>	Pointed-leaved mallow	Red	Green	
<i>Malva moschata</i>	Musk mallow	Red	Green	
<i>Marrubium vulgare</i>	Common horehound	Red		
<i>Medicago carstiensis</i>	Karst snail clover	Yellow	Green	Red
<i>Medicago falcata</i>	Sickle Lucerne	Red		
<i>Medicago falcata</i> × <i>M. sativa</i>	Bastard alfalfa	Green		
<i>Medicago lupulina</i>	Hop Clover	Green		
<i>Medicago minima</i>	Dwarf snail clover	Red		
<i>Medicago sativa</i> s. lat.	Blue alfalfa	Green		
<i>Melampyrum arvense</i>	Field quail wheat	Red		
<i>Melampyrum barbatum</i>	Bearded quail wheat	Green		
<i>Melica ciliata</i>	Ciliated Pearl Grass	Red		
<i>Melica transsilvanica</i> (subsp. <i>transsilvanica</i> )	Transylvanian Pearl Grass	Red		
<i>Mentha x dumetorum</i>	Bush Mint	Yellow	Blue	
<i>Mentha aquatica</i>	Water Mint	Grey	Grey	Grey
<i>Mentha arvensis</i>	Field mint	Yellow	Blue	

<i>Mentha longifolia</i>	Horse Mint	Yellow	Blue	
<i>Mentha pulegium</i>	Polei mint	Yellow	Blue	
<i>Meum athamanticum</i>	Bärwurz	Green		
<i>Microthlaspi perfoliatum</i>	Through-grown puffball cabbage	Pink		
<i>Minuartia gerardii</i>	Alps spring kidney	Green		
<i>Minuartia glaucina</i>	Hill Spring Kidney	Pink		
<i>Minuartia rubra</i>	Tufted kidney	Pink		
<i>Minuartia viscosa</i>	Adhesive kidney	Pink		
<i>Molinia caerulea</i>	Blue Pipe Grass	Blue	Yellow	
<i>Muscari botryoides</i>	Small grape hyacinth	Green		
<i>Muscari comosum</i>	Crested Grape Hyacinth	Pink		
<i>Muscari neglectum</i>	Vineyard Grape Hyacinth	Pink		
<i>Muscari tenuiflorum</i>	Narrow-flowered grape hyacinth	Pink		
<i>Mutellina adonidifolia</i>	Alpine motherwort	Green	Yellow	
<i>Myosotis alpestris</i>	Alpine forget-me-not	Green		
<i>Myosotis discolor</i>	Variegated Forget-Me-Not	Pink		
<i>Myosotis laxa</i>	Lawn forget-me-not	Blue		
<i>Myosotis nemorosa</i>	Grove Forget-me-not	Blue		
<i>Myosotis ramosissima</i>	Hill forget-me-not	Pink		
<i>Myosotis scorpioides</i> (subsp. <i>scorpioides</i> )	Marsh forget-me-not	Blue		
<i>Myosotis stricta</i>	Sand forget-me-not	Pink		
<i>Myosotis sylvatica</i> (s. str.)	Forest forget-me-not	Green		
<i>Narcissus radiiflorus</i>	Star daffodil	Green	Yellow	
<i>Nardus stricta</i>	Bürstling	Green		
<i>Neotinea tridentata</i> (subsp. <i>tridentata</i> )	Variegated orchid	Pink		
<i>Neotinea ustulata</i>	Burnt Orchid	Pink	Green	
<i>Nigritella miniata</i> s. str.	Red cabbage floret	Green		
<i>Nigritella rhellicani</i>	Common cabbage floret	Green	Pink	
<i>Nigritella widderi</i>	Ram's Cabbage Patch	Green	Pink	
<i>Noccaea caerulescens</i> s. lat.	Pre-Alpine bagwort	Green		
<i>Odontites luteus</i>	Yellow tooth rust	Pink		
<i>Onobrychis arenaria</i>	Sand Saving Chain	Pink		
<i>Onobrychis montana</i> (subsp. <i>montana</i> )	Mountain Sainfoin	Pink	Green	
<i>Onobrychis viciifolia</i>	Common sainfoin	Green	Pink	
<i>Ononis arvensis</i>	Goat's hackle	Yellow		
<i>Ononis pusilla</i>	Dwarf Horehound	Pink		
<i>Ononis repens</i> (subsp. <i>procurrens</i> )	Creeping knapweed	Yellow	Green	Pink
<i>Ononis spinosa</i>	thorny knapweed	Pink		
<i>Ononis spinosa</i>	Austrian hackle	Yellow		
<i>Ophioglossum vulgatum</i>	Common Adder Tongue	Blue		
<i>Ophrys apifera</i>	Bee Ragwort	Pink		
<i>Ophrys holoserica</i> (subsp. <i>holoserica</i> )	Bumblebee Ragwort	Pink		
<i>Ophrys insectifera</i> (subsp. <i>insectifera</i> )	Fly Ragwort	Yellow	Green	Pink
<i>Ophrys sphegodes</i> (s. str.)	Spider Ragwort	Pink		
<i>Orchis mascula</i> (s. lat.)	Stately orchid	Green		
<i>Orchis militaris</i>	Helmet orchid	Pink	Green	
<i>Orchis pallens</i>	Pale orchid	Green		
<i>Ornithogalum kochii</i> (s. lat.)	Narrow-leaved milk star	Pink		
<i>Ornithogalum umbellatum</i> s. str.	Conical Milk Star	Green	Yellow	
<i>Ornithogalum vulgare</i>	Common Milky Star	Green		
<i>Orobanche alba</i>	Quendel Summerwort	Pink		
<i>Orobanche caryophyllacea</i>	Bedstraw Summerwort	Pink		

<i>Orobanche gracilis</i>	Blood Red Summer Root			
<i>Orobanche lutea</i>	Yellow summerroot			
<i>Orobanche minor</i>	Clover summerwort			
<i>Orobanche reticulata</i>	Net summerwort			
<i>Orobanche teucrii</i>	Gamander Summerwort			
<i>Oxytropis campestris</i>	Alpine pointed keel			
<i>Oxytropis halleri</i> s. str.	Haller-Spitzkiel			
<i>Oxytropis neglecta</i>	Pyrenees Pointed Keel			
<i>Oxytropis pilosa</i>	Shaggy pointed keel			
<i>Oxytropis triflora</i>	Three-flower pointed keel			
<i>Pachypleurum mutellinoides</i>	Dwarf motherwort			
<i>Parnassia palustris</i>	Swamp Heart Leaf			
<i>Pastinaca sativa</i>	Common parsnip			
<i>Pedicularis elongata</i> (s. str.)	Long-stemmed lousewort			
<i>Pedicularis foliosa</i>	Leafy lousewort			
<i>Pedicularis oederi</i>	Crimson-tipped lousewort			
<i>Pedicularis recutita</i>	Beakless red lousewort			
<i>Pedicularis rostratocapitata</i> (subsp. rostratocapitata)	Beaked lousewort			
<i>Pedicularis rostratospicata</i>	Flesh-pink lousewort			
<i>Pedicularis sylvatica</i> (subsp. sylvatica)	Forest lousewort			
<i>Pedicularis tuberosa</i>	Tuberous lousewort			
<i>Pedicularis verticillata</i>	Whorl Lousewort			
<i>Persicaria bistorta</i>	Snake Knotweed			
<i>Persicaria vivipara</i>	Knotweed			
<i>Petrorhagia prolifera</i> (s. str.)	Sprouting rock carnation			
<i>Petrorhagia saxifraga</i>	Saxifrage rock carnation			
<i>Peucedanum carvifolia</i>	Caraway hair strand			
<i>Peucedanum oreoselinum</i>	Berg-Haarstrang			
<i>Peucedanum ostruthium</i>	Masterwort			
<i>Peucedanum palustre</i>	Swamp Hair Strand			
<i>Phalaris arundinacea</i>	Reed glossy grass			
<i>Phelipanche arenaria</i>	Sand Blue Shrike			
<i>Phelipanche bohemica</i>	Bohemian Blue Shrike			
<i>Phelipanche purpurea</i>	Purple Blue Shrike			
<i>Phleum commutatum</i>	Snow Valley Bluegrass			
<i>Phleum hirsutum</i>	Rough-haired Timothy Grass			
<i>Phleum nodosum</i>	Tuberous bluegrass			
<i>Phleum phleoides</i>	Tumbleweed			
<i>Phleum pratense</i>	Meadow bluegrass			
<i>Phleum rhaeticum</i>	Ciliated Timothy Grass			
<i>Phragmites australis</i>	Reed			
<i>Phyteuma betonicifolium</i>	Betonia Devil's Claw			
<i>Phyteuma hemisphaericum</i>	Grass-leaved devil's claw			
<i>Phyteuma nigrum</i>	Black devil claw			
<i>Phyteuma orbiculare</i>	Round headed devil's claw			
<i>Phyteuma ovatum</i>	Egghead Devil's Claw			
<i>Phyteuma persicifolium</i>	Peach-leaved devil's claw			
<i>Phyteuma scheuchzeri</i>	Scheuchzer Devil's Claw			
<i>Picris hieracioides</i>	Common bittercress			
<i>Pimpinella alpina</i>	Alpineibernelle			
<i>Pimpinella major</i>	Large burnet			
<i>Pimpinella saxifraga</i>	Small burnet			

<i>Pinguicula leptoceras</i>	Thin-spurred butterwort			
<i>Pinguicula vulgaris</i>	Common butterwort			
<i>Plantago alpina</i>	Alpine plantain			
<i>Plantago altissima</i>	Tall stalk plantain			
<i>Plantago atrata</i> (subsp. <i>atrata</i> )	Mountain plantain			
<i>Plantago lanceolata</i>	Pointed plantain			
<i>Plantago major</i> s. lat.	Broad plantain			
<i>Plantago media</i>	Medium plantain			
<i>Plantago strictissima</i>	Snake Plantain			
<i>Platanthera bifolia</i>	White forest hyacinth			
<i>Platanthera montana</i>	Greenish forest hyacinth			
<i>Pleurospermum austriacum</i>	Austrian rib seed			
<i>Poa alpina</i>	Alpine bluegrass			
<i>Poa angustifolia</i>	Narrow-leaved meadow grass			
<i>Poa annua</i> (subsp. <i>annua</i> )	Annual meadow grass			
<i>Poa badensis</i>	Baden bluegrass			
<i>Poa bulbosa</i>	Onion bluegrass			
<i>Poa chaixii</i>	Broadleaf meadow grass			
<i>Poa glauca</i>	Blue green meadow grass			
<i>Poa molinerii</i>	Dry bluegrass			
<i>Poa nemoralis</i>	Wood bluegrass			
<i>Poa palustris</i>	Fowl bluegrass			
<i>Poa pratensis</i>	Meadow bluegrass			
<i>Poa supina</i>	Cudgel Ryegrass			
<i>Poa trivialis</i> s. lat.	Common bluegrass			
<i>Poa variegata</i>	Purple meadow grass			
<i>Polemonium caeruleum</i>	Jacob's ladder			
<i>Polygala alpestris</i> (subsp. <i>alpestris</i> )	Pre-Alpine Cross Flower			
<i>Polygala amara</i>	Bitter crucifer			
<i>Polygala amarella</i>	Marsh crucifers			
<i>Polygala chamaebuxus</i>	Box cross flower			
<i>Polygala comosa</i>	Crested Cruciferous Flower			
<i>Polygala major</i>	Crested Cruciferous Flower			
<i>Polygala serpyllifolia</i>	Quendel cross flower			
<i>Polygala vulgaris</i>	Common milkwort			
<i>Polygonatum odoratum</i>	Genuine Solomon's seal			
<i>Potentilla alba</i>	White cinquefoil			
<i>Potentilla argentea</i> (s. lat.)	Silvery cinquefoil			
<i>Potentilla aurea</i>	Golden cinquefoil			
<i>Potentilla collina</i> agg.	Hill cinquefoil			
<i>Potentilla crantzii</i>	Crantz cinquefoil			
<i>Potentilla erecta</i>	Bloodroot			
<i>Potentilla grandiflora</i>	Large-flowered cinquefoil			
<i>Potentilla heptaphylla</i>	Reddish cinquefoil			
<i>Potentilla incana</i>	Sand cinquefoil			
<i>Potentilla inclinata</i>	Grey cinquefoil			
<i>Potentilla micrantha</i>	Small-flowered cinquefoil			
<i>Potentilla neumanniana</i>	Spring cinquefoil			
<i>Potentilla pusilla</i>	Downy cinquefoil			
<i>Potentilla recta</i>	Upright cinquefoil			
<i>Potentilla reptans</i>	Creeping cinquefoil			
<i>Potentilla sterilis</i>	Strawberry cinquefoil			

<i>Primula elatior</i> (s. str.)	High primrose	Green		
<i>Primula farinosa</i>	Flour Primrose	Yellow	Blue	
<i>Primula halleri</i>	Haller's primrose	Green	Red	
<i>Primula veris</i> (subsp. <i>veris</i> )	Medicinal primrose	Green		
<i>Primula vulgaris</i> (subsp. <i>vulgaris</i> )	Stemless primrose	Green		
<i>Prunella grandiflora</i>	Large flowered brunelle	Red		
<i>Prunella laciniata</i>	White brunelle	Red		
<i>Prunella vulgaris</i>	Common Brunelle	Green		
<i>Prunus fruticosa</i>	Dwarf drawbar	Red		
<i>Prunus mahaleb</i>	Hollyhock	Red		
<i>Prunus spinosa</i> (subsp. <i>spinosa</i> )	Blackthorn	Red		
<i>Pseudorchis albida</i>	Common white tongue	Green		
<i>Pulicaria dysenterica</i>	Common fleabane	Yellow		
<i>Pulmonaria australis</i>	Southern Lungwort	Red		
<i>Pulmonaria mollis</i>	Soft-haired lungwort	Green		
<i>Pulsatilla alpina</i>	Austrian alpine kitchen cherry	Green		
<i>Pulsatilla alpina</i>	Yellow alpine kitchen pasque flower	Green		
<i>Pulsatilla grandis</i>	Large pasque flower	Red		
<i>Pulsatilla montana</i>	Mountain Kitchen Clam	Red		
<i>Pulsatilla pratensis</i> (subsp. <i>nigricans</i> )	Black pasque flower	Red		
<i>Pulsatilla vernalis</i>	Spring kitchen cherry	Green		
<i>Pulsatilla vulgaris</i>	Bavaria Kitchen Clamp	Red		
<i>Ranunculus acris</i> agg.	Sharp buttercup	Green		
<i>Ranunculus auricomus</i> agg.	Golden Crowfoot	Blue	Green	
<i>Ranunculus bulbosus</i>	Bulbous buttercup	Red		
<i>Ranunculus illyricus</i>	Illyrian buttercup	Red		
<i>Ranunculus montanus</i>	Mountain Buttercup	Green		
<i>Ranunculus nemorosus</i>	Forest buttercup	Green		
<i>Ranunculus polyanthemophyllus</i>	Slit Leaf Ranunculus	Red		
<i>Ranunculus polyanthemus</i> agg.	Many-flowered buttercup	Red		
<i>Ranunculus repens</i>	Creeping Buttercup	Yellow		
<i>Ranunculus repens</i>	Forest buttercup	Green		
<i>Ranunculus villarsii</i>	Grenier Buttercup	Green	Red	
<i>Rhamnus saxatilis</i> agg.	Rock buckthorn	Red		
<i>Rhinanthus alectorolophus</i> (s. lat.)	Shaggy Rattlehead	Green		
<i>Rhinanthus glacialis</i>	Grannen rattle pot	Green		
<i>Rhinanthus minor</i>	Small rattletrap	Green		
<i>Rhinanthus serotinus</i>	Large rattle pot	Green		
<i>Rhododendron ferrugineum</i>	Rusty alpine rose	Green		
<i>Rhododendron hirsutum</i>	Ciliated alpine rose	Green		
<i>Rosa canina</i> agg.	Dog Rose	Green		
<i>Rubus caesius</i>	Floodplain Blackberry	Green		
<i>Rubus fruticosus</i> agg.	Real blackberries	Green		
<i>Rubus idaeus</i>	Raspberry	Green		
<i>Rumex acetosa</i> (subsp. <i>acetosa</i> )	Meadow Sorrel	Green		
<i>Rumex acetosella</i> (s. lat.)	Dwarf Sorrel	Red		
<i>Rumex alpestris</i>	Mountain Amp	Yellow		
<i>Rumex alpinus</i>	Alpine Amp	Yellow		
<i>Rumex conglomeratus</i>	Knotted ampulla	Yellow		
<i>Rumex crispus</i>	Curly dock	Green		
<i>Rumex obtusifolius</i>	Blunt-leaf ampulla	Green		
<i>Rumex thyrsoiflorus</i>	Panicle ampulla	Green		
<i>Sagina nodosa</i>	Knot mast weed	Yellow		



<i>Sagina procumbens</i>	Lying mast weed			
<i>Sagina saginoides</i>	Alpine mast herb			
<i>Salix cinerea</i> (s. str.)	Ash Willow			
<i>Salix mielichhoferi</i>	Tauern Pasture			
<i>Salix myrsinifolia</i>	Black Willow			
<i>Salix pentandra</i>	Laurel Willow			
<i>Salix purpurea</i>	Purple willow			
<i>Salix repens</i>	Kriech-Weide			
<i>Salvia austriaca</i>	Austria sage			
<i>Salvia nemorosa</i>	Tumbleweed			
<i>Salvia pratensis</i> (subsp. <i>pratensis</i> )	Meadow Sage			
<i>Salvia verticillata</i>	Whisk Sage			
<i>Sanguisorba minor</i>	Small meadow buttercup			
<i>Sanguisorba officinalis</i>	Large meadow buttercup			
<i>Saponaria pumila</i>	Dwarf soapwort			
<i>Saussurea alpina</i>	Common alpine loophole			
<i>Saussurea discolor</i>	Felt alpine loophole			
<i>Saussurea pygmaea</i>	Dwarf alpine loophole			
<i>Saxifraga bulbifera</i>	Onion saxifrage			
<i>Saxifraga granulata</i> (subsp. <i>granulata</i> )	Knotted saxifrage			
<i>Scabiosa canescens</i>	Scented Kabiosa			
<i>Scabiosa columbaria</i> agg.	Pigeon Scabiosa			
<i>Scabiosa lucida</i>	Glossy scabiosa			
<i>Scabiosa ochroleuca</i>	Yellow scabiosa			
<i>Scabiosa triandra</i>	Southern scabiosa			
<i>Scirpus sylvaticus</i>	Common forest rush			
<i>Scleranthus polycarpus</i>	Wild knotweed			
<i>Scorzonera austriaca</i>	Austrian black salsify			
<i>Scorzonera cana</i>	Common stem seed			
<i>Scorzonera humilis</i>	Low black salsify			
<i>Scorzonera purpurea</i>	Purple Black Root			
<i>Scorzonera rosea</i>	Rose Black Root			
<i>Scorzoneroides autumnalis</i>	Autumn Scale Glow Tooth			
<i>Scorzoneroides helvetica</i>	Swiss Scaled Glow Tooth			
<i>Scutellaria galericulata</i>	Marsh hellebore			
<i>Scutellaria hastifolia</i>	Skewer hellebore			
<i>Securigera varia</i>	Variiegated crown vetch			
<i>Sedum acre</i>	Pungent wall pepper			
<i>Sedum album</i>	White wall pepper			
<i>Sedum sexangulare</i>	Mild wall pepper			
<i>Selaginella selaginoides</i>	Thorny moss fern			
<i>Selinum carvifolia</i>	Caraway Sylt			
<i>Sempervivum arachnoideum</i>	Cobweb houseleek			
<i>Sempervivum wulfenii</i>	Wulfen houseleek			
<i>Senecio abrotanifolius</i>	Ragwort			
<i>Senecio aquaticus</i> s. str.	Water-Greenwort			
<i>Senecio cacaliaster</i>	Butterbur verbena			
<i>Senecio cordatus</i>	Alpine Greengage			
<i>Senecio doronicum</i> (s. str.)	Chamois Root Grassweed			
<i>Senecio erraticus</i>	Spreading Grass Weed			
<i>Senecio erucifolius</i>	Rauken-Greiskraut			
<i>Senecio incanus</i> agg.	Grey verbena			

<i>Senecio jacobaea</i>	Jacob's verbena			
<i>Senecio ovatus</i>	Fox Grouse			
<i>Senecio subalpinus</i>	Berg-Greissraut			
<i>Serratula tinctoria</i>	Färber-Scharte			
<i>Seseli annuum</i>	Steppe Mountain Fennel			
<i>Seseli austriacum</i>	Austrian mountain fennel			
<i>Seseli hippomarathrum</i>	Horse Mountain Fennel			
<i>Seseli libanotis</i>	Mountain hellebore			
<i>Seseli pallasii</i>	Variegated mountain fennel			
<i>Sesleria caerulea</i> (s. str.)	Lime bluegrass			
<i>Sesleria sphaerocephala</i>	Round headed blue grass			
<i>Sesleria uliginosa</i>	Bog bluegrass			
<i>Sideritis montana</i>	Mountain limb herb			
<i>Silaum silaus</i>	Europe meadow silge			
<i>Silene acaulis</i>	Silicate cushion cinquefoil			
<i>Silene acaulis</i>	Lime cushion cinquefoil			
<i>Silene dioica</i>	Red campion			
<i>Silene latifolia</i>	White campion			
<i>Silene nemoralis</i>	Grove Flax			
<i>Silene nutans</i>	Nodding toadflax			
<i>Silene otites</i>	Ear spoon cinquefoil			
<i>Silene vulgaris</i>	Eye blistered toadflax			
<i>Solidago canadensis</i>	Canadian goldenrod			
<i>Solidago gigantea</i>	Giant Goldenrod			
<i>Solidago virgaurea</i>	Goldenrod			
<i>Spiranthes spiralis</i>	Autumn rotation			
<i>Stachys recta</i>	Upright sweetgum			
<i>Stellaria graminea</i>	Common stitchwort			
<i>Stellaria media</i> (s. str.)	Bird's Chickweed			
<i>Stellaria palustris</i>	Marsh Stitchwort			
<i>Stipa capillata</i>	Feather grass			
<i>Stipa eriocalis</i>	Ornamental feather grass			
<i>Stipa pennata</i> ss. orig.	Grey sheath feather grass			
<i>Stipa pulcherrima</i> (subsp. pulcherrima)	Big feather grass			
<i>Succisa pratensis</i>	Common devil sabbite			
<i>Succisella inflexa</i>	Bald Swamp Bite			
<i>Symphytum officinale</i> (s. str.)	Common comfrey			
<i>Tanacetum corymbosum</i>	Ostrich Rain Fern			
<i>Taraxacum</i> sect. <i>Alpestris</i>	Species group Blackish Dandelion			
<i>Taraxacum</i> sect. <i>Alpina</i>	Alpine dandelion species group			
<i>Taraxacum</i> sect. <i>Cucullata</i>	Species group hooded dandelion			
<i>Taraxacum</i> sect. <i>Erythrosperma</i>	Species group callus dandelion			
<i>Taraxacum</i> sect. <i>Hamata</i>	Species group hook.dandelion			
<i>Taraxacum</i> sect. <i>Palustria</i>	Species group marsh dandelion			
<i>Taraxacum</i> sect. <i>Ruderalia</i>	Species group meadow dandelion			
<i>Tephrosieris crispa</i>	Bach ash herb			
<i>Tephrosieris helenitis</i>	Elecampane ash herb			
<i>Tephrosieris integrifolia</i> (s. lat.)	Steppe tumbleweed			
<i>Tephrosieris longifolia</i> (s. str.)	Pre-Alpine Ash Weed			
<i>Tephrosieris tenuifolia</i>	Swiss ash herb			
<i>Teucrium botrys</i>	Grape germander			
<i>Teucrium chamaedrys</i> (subsp. chamaedrys)	True germander			
<i>Teucrium montanum</i>	Mountain germander			

<i>Teucrium scordium</i> (s. str.)	Garlic germander	Blue		
<i>Thalictrum aquilegifolium</i>	Columbine meadow rue	Green		
<i>Thalictrum flavum</i>	Yellow meadow rue	Blue		
<i>Thalictrum foetidum</i>	Stinking meadow rue	Red		
<i>Thalictrum lucidum</i>	Glossy meadow rue	Blue		
<i>Thalictrum minus</i>	Mountain meadow rue	Red		
<i>Thalictrum simplex</i> (s. lat.)	Simple meadow rue	Blue		
<i>Thesium alpinum</i>	Alpine Mountain Flax	Red		
<i>Thesium bavarum</i>	Big mountain flax	Red		
<i>Thesium linophyllum</i>	Medium mountain flax	Red		
<i>Thesium pyrenaicum</i>	Meadow Mountain Flax	Red		
<i>Thymus kosteleckyanus</i>	Hungarian thyme	Red		
<i>Thymus odoratissimus</i>	Austrian thyme	Red		
<i>Thymus praecox</i>	Creeping thyme	Red		
<i>Thymus pulegioides</i>	Medicinal thyme	Red		
<i>Thymus serpyllum</i> (s. str.)	Breckland thyme	Red		
<i>Tofieldia calyculata</i>	Common Siamese Lily	Yellow	Blue	
<i>Tragopogon dubius</i>	Common salsify	Red		
<i>Tragopogon orientalis</i>	Large flowered meadow goatsbeard	Green		
<i>Traunsteinera globosa</i>	Kugelorchis	Green		
<i>Trifolium alpinum</i>	Alpine Clover	Green		
<i>Trifolium arvense</i> (subsp. <i>arvense</i> )	Rabbit Clover	Red		
<i>Trifolium badium</i>	Brown Clover	Yellow		
<i>Trifolium campestre</i>	Field Clover	Green		
<i>Trifolium dubium</i>	Thread Clover	Green	Red	
<i>Trifolium fragiferum</i> (subsp. <i>fragiferum</i> )	Strawberry Clover	Yellow		
<i>Trifolium hybridum</i>	Swedish clover	Green		
<i>Trifolium medium</i> (subsp. <i>medium</i> )	Zigzag Clover	Red		
<i>Trifolium montanum</i> (subsp. <i>montanum</i> )	Mountain Clover	Red		
<i>Trifolium ochroleucon</i>	Pale yellow clover	Red		
<i>Trifolium patens</i>	Switzerland-Clover	Yellow		
<i>Trifolium pratense</i>	Meadow Clover	Green		
<i>Trifolium repens</i> (subsp. <i>repens</i> )	Creeping Clover	Green		
<i>Trifolium spadiceum</i>	Bog Clover	Yellow	Blue	
<i>Trifolium thalii</i>	Thal's Klee	Green		
<i>Triglochin palustre</i>	Swamp Trident	Blue		
<i>Trinia glauca</i> (subsp. <i>glauca</i> )	Honewort	Red		
<i>Trisetum alpestre</i>	Oatgrass	Green	Yellow	
<i>Trisetum flavescens</i>	Golden oatgrass	Green		
<i>Trollius europaeus</i>	European troll flower	Blue		
<i>Urtica dioica</i>	Great nettle	Green		
<i>Vaccinium gaultherioides</i>	Small-leaved dewberry	Green		
<i>Vaccinium myrtillus</i>	Blueberry	Green		
<i>Vaccinium uliginosum</i> (s. str.)	Bog bilberry	Blue	Yellow	
<i>Vaccinium vitis-idaea</i>	Cranberry	Green		
<i>Valeriana celtica</i> (subsp. <i>norica</i> )	Real spike	Green		
<i>Valeriana dioica</i> (subsp. <i>dioica</i> )	Marsh valerian	Yellow	Blue	
<i>Valeriana officinalis</i>	Vorarlberg medicinal valerian	Yellow		
<i>Valeriana officinalis</i>	Actual medicinal valerian	Yellow		
<i>Valerianella carinata</i>	Keel field salad	Red		
<i>Valerianella dentata</i>	Tooth field salad	Red		
<i>Valerianella locusta</i>	Common lamb's lettuce	Red		

Valerianella rimosa	Furrow Field Lettuce			
Veratrum album	Actual white tanner			
Veratrum album	Green white tanner			
Verbascum alpinum	Wool King Candle			
Verbascum blattaria	Grape King Candle			
Verbascum chaixii	Austrian Chaix royal candle			
Verbascum densiflorum	Large flowered mullein			
Verbascum lychnitis	Flour royal candle			
Verbascum nigrum	Dark mullein			
Verbascum phlomoides	Common mullein			
Verbascum phoeniceum	Purple Royal Candle			
Verbena officinalis	Real verbena			
Veronica arvensis	Field Speedwell			
Veronica austriaca	Austrian Honorary Award			
Veronica bellidioides (subsp. bellidioides)	Maßlieb Speedwell			
Veronica chamaedrys (s. str.)	Germander speedwell			
Veronica dillenii	Dillenius Speedwell			
Veronica maritima	Long-leaved speedwell			
Veronica officinalis	Real speedwell			
Veronica persica	Persian speedwell			
Veronica praecox	Early Speedwell			
Veronica prostrata (s. str.)	Lying Speedwell			
Veronica serpyllifolia	Thyme Speedwell			
Veronica spicata (s. str.)	Spiked Speedwell			
Veronica teucrium	Large speedwell			
Veronica verna (s. str.)	Spring Speedwell			
Veronica vindobonensis	Vienna germander speedwell			
Vicia angustifolia	Narrow-leaved vetch			
Vicia cracca (s. strictiss.)	Bird Vetch			
Vicia hirsuta	Rough hairy vetch			
Vicia incana	Rough vetch			
Vicia lathyroides	Flat pea vetch			
Vicia pannonica	Hungarian vetch			
Vicia sativa	Seed Vetch			
Vicia sepium	Fence vetch			
Vicia tenuifolia	Fine-leaved vetch			
Vicia tetrasperma (s. str.)	Four seeded vetch			
Vincetoxicum hirundinaria (subsp. hirundinaria)	True swallowwort			
Viola ambigua	Tumbleweeds			
Viola canina	Schultz Dog Violet			
Viola canina	Actual dog violet			
Viola canina	Mountain Dog Violet			
Viola hirta	Meadow Violet			
Viola kitaibeliana	Steppe pansy			
Viola palustris	Marsh Violets			
Viola rupestris	Sand Violets			
Viola tricolor (s. str.)	Common pansy			
Viscaria alpina	Alpine Pechnel			
Viscaria vulgaris	Common Pechnel			
Willemetia stipitata (subsp. stipitata)	Crown lettuce			
Wulfenia carinthiaca (subsp. carinthiaca)	Cow's footprint			
Xeranthemum annuum	Annual everlasting			

		dry		
		fresh (moderately moist to moderately dry)		
		moist		
		wet		

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