

Changing European meadows: A comparative study on the historical development of meadow use and definitions across eight countries

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Abstract

Hay meadows have played a crucial role in European agricultural history, evolving from leaf collection to scythe-mown grasslands integral to manure-based arable farming systems. While once widespread, traditional meadows have largely been replaced by fodder crops and are now valued primarily for their biodiversity. This paper examines the historical development and shifting definitions of hay meadows across eight European countries – Norway, Sweden, Estonia, Latvia, Poland, Switzerland, Italy, and Spain – highlighting how linguistic, ecological, and socio-political factors have shaped their meaning and use over time. Drawing on historical sources, national dictionaries, and agricultural literature, it traces regional trajectories from the Iron Age to the present. The study reveals a general trend towards broader, less management-specific definitions, reflecting a shift from practice-based agricultural functions to vegetation-focused and conservation-oriented perspectives, albeit with important regional variation. This semantic shift risks obscuring the management processes underpinning meadow biodiversity and contributes to a growing decoupling from agricultural systems. Meadows today increasingly form part of a policy-driven landscape, where their persistence depends on subsidies rather than production, highlighting the need for policies that prioritise management practices and account for regional historical legacies.

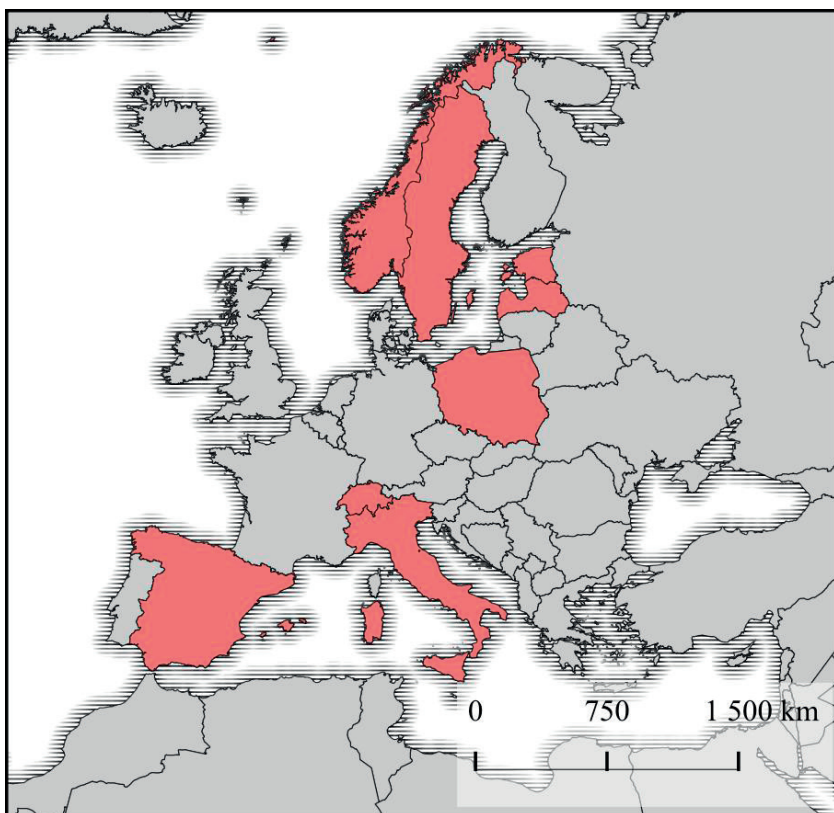
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Introduction

Historically, hay meadows played an integral part of European agriculture, providing animal fodder, and often linked with winter stalling practices and the collection of manure for permanent arable fields (Lennartsson et al., 2016). Initially animal fodder practices involved leaf collection, and later developed into semi-natural hay meadows with the introduction of the scythe during the Iron Age (Eriksson, 2020; Hejzman et al., 2013). While traditional practices survive in regions like parts of Romania, most meadows have now been replaced by fodder crops grown on arable fields. Today, traditional hay meadows are instead valued for their biodiversity, and European grasslands are among the most biodiverse ecosystems globally, although threatened by agricultural intensification (Veen et al. 2014).

Research on historical hay meadow diversity is limited compared to research on other agricultural activities, as agrarian-historical research tends to focus on the arable fields (Liljewall 1999; Renes 2010). Meadows have been researched primarily from an ecological perspective (Manton and Angelstam 2021). Despite recent efforts to expand knowledge on historical meadow systems and its heritage (e.g. Kruse et al. 2023), little attention has so far been paid to how definitions of hay meadows vary across Europe and reflect the diverse land-use histories. Studying the history of definitions is vital because linguistic shifts interact with and helps explain the historical transformations and changing functional roles of meadows within the physical landscape. Furthermore, analysing contemporary definitions provides a necessary lens to understand how modern management priorities – often focused on given vegetation types – differ from the process-oriented agricultural practices of the past.

This paper analyses the diversity of historical meadows systems and definitions from a European perspective, by compiling and synthesising existing knowledge of meadow histories from eight European countries. The paper aims to demonstrate how historical insights, through cross-country comparisons, are essential for designing more effective hay meadow conservation and restoration policies in a European context. It does this by examining the historical contexts in which meadow land use have been introduced and transformed. The paper is based on a review of linguistic sources, in majority provided by modern and historical dictionaries, and an investigation of existing meadow literature from eight countries (see Map 1): Norway, Sweden, Estonia, Latvia, Poland, Switzerland, Italy and Spain producing a comparative narrative of meadow definitions and historical transformation processes from prehistory to modern times.



Map 1. Map showing the location of the countries studied in this paper, marked in red. Data from Natural Earth.

Earlier research

Historical research has recently begun to emphasize the significance of meadow systems for local economies, settlement patterns, and heritage (Bele et al. 2024; Kruse et al. 2023; Janišová et al. 2023; Lennartsson et al. 2016; Renes et al. 2020; Vázquez 2020). Ecologically, the debate continues regarding whether European grasslands persisted after the glacial period due to large herbivores and floodplains, or if they were created through human agricultural clearing (Hejcman et al. 2013; Kuneš et al. 2015). Despite these differing views, there is a consensus that the conservation of modern semi-natural grasslands relies heavily on traditional human management (Dahlström et al. 2013).

Two studies offer vital comparative perspectives across different countries of Europe. Kruse et al. (2023) survey hay-making across nine European countries, noting that while traditional practices have largely declined due to intensified fodder production, they remain essential for biodiversity and rural identity. While traditional hay-making persists in Romania, Slovakia, and Slovenia, it is primarily a conservation activity elsewhere.

Lennartsson et al. (2016) examine the transformation of hay production in Sweden, France, and Romania. All three regions historically relied on the synergy between livestock – providing manure and power – and arable farming. However, the transition to modern fodder production differed; changes in Sweden and France were market-driven, whereas Romanian land use was significantly shaped by communist policies and subsequent EU integration.

Building on these insights, this paper further analyzes meadow transformation processes and evolving meadow definitions across a broader European context.

Changes in meadow definitions over time

The rich and long history of meadows in Europe and the multiple languages spoken has led to an abundance of names with varying meanings over time. Some are linguistically related, such as the terms *eng* in Norwegian and *äng* in Swedish, while others are from neighbouring countries but they have separate linguistic roots, such as in Latvia and Estonia. This section primarily divides meadow definitions according to their development patterns over time, rather than their linguistic relations.

In many countries, the definition of meadows has expanded from a strict association with mowing by scythe to a broader concept encompassing both mowing and grazing (Table 1). In **Norway and Sweden**, the historical meaning of *äng* (Sw.) and *eng* (Nw.) referred to land mown for fodder and only grazed after the hay harvest ('Äng', SAOB, 2023-02-24). Over time, the Norwegian definition has evolved into "a piece of land with grass and other plants, often used for mowing or pasture" (Norsk ordbok). In Sweden, the modern colloquial definition emphasises a rich flora dominated by grasses and herbs without mentioning management practices ('Äng', svenska.se, 2023-02-24). However, in nature conservation, the term still refers to land that is unploughed, unfertilised, and maintained through mowing (Jordbruksverket 2012:7). A similar shift has occurred in **Spain**. Historically, *prados* (meadows) were primarily associated with mowing, largely because

grazing typically took place only after the hay had been harvested. Today, definitions proposed in conservation science and agronomy encompass both mowing and grazing (Ferrer et al., 2001), whereas the Royal Spanish Academy's dictionary defines *prado* simply as pasture on irrigated or humid grasslands, without any reference to mowing. In **Estonia**, a historical distinction existed between hay meadows (*henamaa*, *aas*, *niit*) pastures (*karjamaa*) (Wiedemann 1973, Ligi 1963). These terms did not describe vegetation cover, but only their use, and included coastal meadows, floodplains, swamps and sparse woodlands. Most traditional grasslands had a sparse or dense cover of trees and shrubs until the 20th century. The modern Estonian term *niit* (meadow) originates from *niitma*—"to cut hay" (EKI combined dictionary 2022)—yet in contemporary vegetation classification, *niit* refers broadly to all types of semi-natural grasslands (Paal 1997).

Some countries follow similar but slightly different developments. In **Poland**, the term *tąka* (meadow) originally referred to periodically wet land with grass, flowers, and sometimes trees (Mayenowa 1979, 538). By the 19th century, mowing became part of the definition, distinguishing between self-established grasslands and hay meadows (Zdanowicz et al. 1861; Karłowicz et al. 1902). Today, it can also include sedgeland and pastures (Szwejkowska and Szwejkowski 2003). Botanically, meadows are areas where species depend on mowing, usually 1–3 times per year (Szwejkowska and Szwejkowski 2003). Agriculturally, meadows and pastures fall under *użytki zielone* (green crops). In modern times meadows are often defined as fodder land for hay or silage, while pastures support grazing. However, in practice, their use overlaps, as meadows may alternate between mowing and grazing or rotate with other land uses, complicating distinctions over time (Tołwińska 1973; Rogalski 2004).

Among the countries covered here, only **Latvia** and **Italy** show relative stability in meadow definitions over time. In **Latvia**, *pļava* (meadow) is a subcategory of *zālājs* (grassland ecosystems), characterised by grass, sedge, and herbs removed through haymaking or grazing (Rūsiņa et al. 2017). In everyday speech, *zālājs* can be confused with lawns, so *dabiskā pļava* (natural meadow) is often used in public communication (Grassland expert-private communication). Officially, meadows and pastures include fodder land not in rotation for over five years (Latvian Statistics 2022). Historically, the interchangeability of mowing and grazing in the Latvian definition is well-documented (Barons 1915; Milenbahs 1932; Endzelīns and Hauzenberga 1946).

In **Italy**, *prato* (meadow) is linked to fodder production through mowing. Official terminology varies based on species diversity, but

definitions have remained consistent since at least the 1930s. According to Alessandro Vivenza (Treccani 1935), a meadow is “land covered with spontaneous or sown grass, intended for fodder, mown entirely or partially for fresh feed, hay, or preservation.” If grazing covers about 50% of the surface, the term “meadow-grazing” applies (Treccani, online encyclopaedia), while land primarily used for grazing remains a pasture, even if occasionally mown.

In German-speaking **Switzerland**, the older term *Matte* was tied strictly to mowing, while *Wiese* originally referred to pasture land (Boesch 1945; Ortsnamen.ch). From the 9th century onwards, *Wiese* gradually displaced *Matte* from east to west, a linguistic shift potentially linked to new forms of cultivation (Boesch 1945). Although *Wiese* is now the standard term for mown meadows, the historical prevalence of *Matte* remains clearly visible in toponyms and western Alemannic dialects. Despite this shift, the focus on mowing has remained intact in the Swiss German definition (as well as in German in general), where the term *weide* is used for pastures.

Historical Timeline of Meadows

In the evolution of meadows there are specific aspects that relates to all the countries listed in this article, although they may have adopted the new technology or practices at different times. There are also some country-specific elements. In the following section the common origins are outlined followed by sections, which are more focussed on country-specific elements. Importantly, it should be noted that this chapter deals with hay meadows managed for the collection of fodder, and not grasslands in general. As noted earlier, the longer history of grasslands in Europe is more complicated (e.g. Kuneš et al. 2015).

The origins, permanent fields and the scythe revolution

Animal husbandry was introduced during the neolithic period and intensified during the bronze age across many European countries. Feeding practices were primarily tied to the collection of leaves as winter fodder but developed gradually over time into the use of hay meadows (Eriksson 2020; Hejzman et al. 2013).

Two processes are highly important when it comes to the development of meadow land use throughout Europe: the introduction of permanent fields and the gradual development of scythes. Generally, the collection of fodder is not primarily connected to winter feeding practices, not even

in Northern Europe. Instead, the necessity of hay has been tied to stalling practices with the primary intent to produce manure for intensively used arable fields in need of fertilisation (Widgren 2012). The establishment of permanent fields is thus often closely tied to the development of meadows.

For example, in Italy meadows goes back further to the establishment of permanent fields connected to Greek colonisation in the 5th century B.C., when fallow and fertilisation of arable fields and fences were introduced to agriculture in the area. During the period preceding this, shifting cultivation had been practiced without permanent fields. The same has been argued for Sweden with the establishment of the first wet hay meadows around 0-500AD (Widgren 2012, Pedersen and Widgren 1998: 253-58), and is evident from many other contexts as well (Emanuelsson 2005).

The introduction of scythes for mowing hay is a very important indicator of the first development of hay meadows. For many of the countries covered here, this introduction dates to the Iron Age. In many parts of Central Europe, including Poland, the first iron scythes were introduced around the 7th-6th centuries BC after the semi-scythes (Beranová and Kubačák 2010, after Hejzman et al. 2013; Labuda and Stieber 1982, 262) leading to a gradual transition from leaves to hay (Beranová and Kubačák 2010, after Hejzman et al. 2013).

In Latvia the scythe was adopted c. 1-400AD (Gustiņa, 2016). In Estonia the adoption of the scythe is dated to the middle of the first millennium (Laul and Tõnisson 1991). In Norway, a runic inscription on a whetstone reveals that a scythe, probably with a short snath, was in use at least from 400AD and formed the optimal solution for mowing on the steep and hilly terrain (Kolås 2012, Herschend 2020). The long-snathed (handled) scythe was introduced during the early Middle Ages (ca 1066-1130) but only played a minor role except in limited areas of the country where permanent arable land was found, since such fields relied on the collection of manure and in turn winter stalling. In Sweden, scythes with a short snath were introduced during the Roman Iron Age (c. 0-400 AD) while the long-snathed right-angled scythe was introduced first during the later Middle Ages (Myrdal 1999). In Switzerland, however, meadows were introduced more commonly after the introduction of new improved steel scythes in the late Middle Ages.

Middle Ages to the early modern period

Norway

In addition to the infenced arable and meadow a great variety of areas were used for gathering fodder. The use of outlying land as a common resource for pasture and hay-mowing is reflected in the earliest written laws in

Norway written down during the 12th and 13th century at a time when demographic numbers were rising. This resulted in a more restricted attitude towards common resources, but access to, and use of land far from the farm and the enclosed infields, was subjected to less rigid rules of ownership (Lunden 2002). For example: fens and bogs in outlying land were mowed approximately each third year and was accrued to “the first man” to set the sickle or scythe in it.

Sweden

Technological and population related developments in Sweden during the Middle Ages and early modern period led to diversified meadow land-use and included large tracts of dry meadows in the southern half of the country (Lagerås et. al 2016, Emanuelsson 2005, Myrdal 1999). In the north, where Sámi populations traditionally dominated, the landscape was more strongly colonised by settlers from the agrarian societies of southern and central Sweden during this period, and wet meadows remained most common here until modern times. After the hay harvest many meadows were used for grazing. Ploughing and fertilisation was not practiced on meadows, apart from areas in northern Sweden (Larsson 2005)

Estonia

During the Middle Ages, meadows played a key role in the three-field system, providing fodder for stalled animals that, in turn, produced manure for crops. While arable land followed the open-field system with numerous strips, hay meadows were typically divided among village farms, with pastures remaining common land.

In western Estonia, large grasslands like alvars, coastal meadows, and wooded meadows were common, supporting more cattle, meadows, and permanent fields (Ligi 1963). In contrast, eastern Estonia had more floodplain and wetland meadows, smaller cattle stocks, and widespread slash-and-burn cultivation until the late 19th century (Jääts et al. 2010). Meadows here were often remote, sometimes tens of kilometres from farms, and traditionally had fewer trees and bushes than pastures. The first recorded meadow improvement in Estonia dates to 1565 (Kuum 1994).

Latvia

From the 12th and 13th centuries and into the 19th century, meadows in Latvia were primarily used by the peasant population to feed their animals. The livestock were primarily used for fertilisation of fields and the quality of the feed was not considered important. Low-yielding grasslands with a history

of mowing and grazing from this period have remained until today but the more moderately fertile grasslands only persisted in the floodplains, others eventually became arable land. During the middle ages and early modern periods, manors focused heavily on arable farming and forestry, sometimes with expansion unto peasant meadows and pastures (Gustiņa 2016).

Poland

Grasslands in Central Europe (and in Poland) in the Middle Ages were characterised by a high diversity (Hejcman et al. 2013). Meadows served a three- field rotation system, which was directed to grain production and relied upon domestic animals (e.g. Falkowski and Kostrowicki 2001). Most meadows, however, were situated in the river valleys on land that could not be used for arable fields. Since the 16th century, many of these meadows were drained. Population expansion since the Middle Ages was closely tied to the expansion of arable fields on high-quality soils previously consisting of meadows and pastures, while meadows and pastures instead expanded to the cleared forests and drained wetlands (Falkowski and Kostrowicki 2001).

Switzerland

In Switzerland, meadows were rare in the three-field rotation system until the mid-18th century. However, their prevalence increased with the introduction of improved steel scythes in the late Middle Ages. In the inner and southern Alpine regions, agropastoralism, including cheese production, has long been common, combining grain cultivation with livestock farming. High-altitude grain cultivation was possible on dry valley slopes, while lower valley bottoms were used for meadows (Rougier 2002, 105). The expansion of livestock production was supported by the growing use of meadow irrigation (Mathieu 1992, 174; Schweizer 2014, 7). Irrigated meadows have existed in Switzerland since at least the 9th century (Leibundgut and Vonderstrass 2016, 69), though they are now rare. In the northern Alps, livestock farming became the dominant focus in the late Middle Ages, driven by colder climates in the 14th and 15th centuries and rising demand for hard cheese and animal products (Bätzing 2015, 72-73).

Italy

Reclamation of wetlands during the Middle Ages was related to open field agriculture (Sereni 1961). This was mainly conducted by the Cistercian monks who utilised the water meadows technique, based on the winter submersion with underground warm water (locally called *marcite*) (Chiappa Mauri & Fantoni 2001). During the 16th century, in northern Italy, reclamations and

water meadow expansion accelerated further, combined with mountain pastures and the introduction of crop rotation systems in which maize from the Americas played an important role.

Spain

In Spain, the first documented references to meadows date back to the foundation of present-day villages between the 8th and 11th centuries (García & Díez 1982, 153-154). However, during the Middle Ages, the area of meadowland constituted a minor percentage of the Spanish agrarian landscape (Ortega 1987, 67). There are several reasons that explain an increase in the meadowland area from the early modern times onwards: from a socioeconomic point of view, the population growth and the development of agricultural markets (Lanza 2010); and, from a livestock management perspective, the decline of bovine transhumance, which forced many peasants to increase the meadowland area to feed their cattle during the winter (Vázquez 2016, 102-111, 2020).

Agricultural Revolution (c. 1700-1900)

The advent of the agricultural revolution also had a significant impact on meadows and hay production, with the introduction of extensive drainage and fertilisation of fields.

Norway

At shielings, hay was harvested and transported to the valley or fjord-side farms. From the 17th to the 20th century, increasing land pressure forced the use of even the smallest grass plots. This chronic winter-fodder shortage sparked ingenious gathering methods across diverse environmental niches (Ropeid 1960, Gjerdåker 2002). Despite the agricultural revolution's land consolidation, steep and rugged terrain required the continued use of traditional methods, supplemented by innovations like ziplines for hay transport (Moe 1977). By the 19th century, sown meadows (*kultureng*) using clover and timothy were introduced, followed by the use of artificial fertilizers around 1900 (Byrkejland, Pettersson & Dahle 2007).

Sweden

During the agricultural revolution after 1750 hay production was gradually but slowly moved to cultivated arable fields, with sown grass types on ploughed and fertilised land (Gadd 2000). Regionally, and especially in southern and northern Sweden, water meadows were also introduced (Emanuelsson and Möller 1991). The development of ley cultivation accelerated

rapidly during the end of the 19th century, especially due to a transformation towards increased commercial milk production and most meadows were cultivated in this process (Israelsson 2005, Morell 2001).

Estonia

In the 19th century, Baltic German nobles responded to falling grain prices by shifting toward animal husbandry and land reforms, including clover cultivation, peatland drainage, and fertilization (Kuum 1994). The Landeskultur-Bureau (1887) accelerated these efforts with over 1,300 reclamation projects (Eller et al. 1998). This era of agricultural modernization and nationalist awakening saw extensive land enclosures and peasant purchases; by the late 19th century, peasants had bought 86% of the Estonian part of the Livonian Governorate and 50% of the Estonian Governorate (Kahk 1993).

Supported by the Estonian Society of Farmers (est. 1870), peasants adopted modern agricultural practices, guided by Estonian-language agricultural publications (Rosenberg 2013). As multi-field systems and drainage for hay cultivation expanded, semi-natural grasslands peaked at 1.8 million hectares by the early 20th century (Eller et al. 1998, Kuk & Sammul 2006). Semi-natural grasslands remained more widely in use in western Estonia and on the islands, where coastal meadows and alvars were widespread, while clover cultivation in arable fields expanded rapidly in southern Estonia (Tomson and Astover, 2025).

Latvia

Latvia followed a similar trajectory to Estonia with land owned by the Baltic Germans on manorial properties. During the 19th century, agriculture intensified on manorial lands with a decrease of meadows due to reclamation and clearance. However, the data is scarce, so the total extent of meadow decrease is difficult to estimate (Bell et al. 2009). During this period improved grasslands (e.g. clover fields) were also increasingly used due to an increased production of meat for the cities. (Gustiņa 2016). This suggests that meadows were tied to peasant farming with improved grasslands and clover tied to the manorial system, where ploughing of the fields occurred. Latvia also saw a nationalistic awakening in the 19th century (Kasekamp 2011) which later was followed by the country's independence (Printsmann et al. 2019; Storie & Bell 2017).

Poland

Important land-use shifts marked the countryside in Poland during the 19th century. Reforms leading to peasant enfranchisement were implemented.

Additionally, in the second half of this century a huge increase in the area of arable fields occurred (up to 60% in western Poland). Between 1870 and 1910 a significant rise in cattle breeding was witnessed, accompanied with a decrease in sheep rearing (Jezierski and Leszczyńska 2010). Milk production required large amounts of fodder, which was supplied by areas obtained from turning pastures into meadows and from wetland drainage. Bucek (2000, after Hejcman 2013) confirms that both arable fields and meadows expanded rapidly on former pastures in the entire Central Europe.

Switzerland

It was not until the modernisation of farming in the 19th century that meadows came to dominate over the pastures in Switzerland, as is currently the case (Bosshard 2016, 21). This continued after the early 19th century, with increasing cheese production in northern Switzerland (Pfister Egli 1998, 128), and the introduction of artificial meadows sown with clover and grass seeds in rotation (Käser 1855, 131, 141). A special type of species-rich meadow, the *fromental meadow* which was highly productive on good soils with only organic fertilisers and limited pasture, was also introduced in this process (Bosshard 2016, 191-193).

Italy

During the 17th century, the peasants wanted to enclose common grazing areas for other uses, which was opposed by noble and ecclesiastical landowners. But during the end of the 18th century, such private enclosure on common lands nonetheless became allowed and the expansion of sown and artificial meadows accelerated as a result (Sereni 1961). The water meadows (locally named *marcite*), using spring water and submerging fields throughout the whole winter period, expanded considerably in the Milanese plain, producing a third more than an irrigated meadow to feed dairy cattle and horses (Soresi 1822; Berra 1914).

Spain

Dairy specialisation, which began in the 19th century, was accompanied by an increase in the meadowland area, the adoption of new forage techniques such as silage, and the introduction of the Holstein-Friesian bovine breed (Mazón 2008). In addition, many grainlands close to the villages were converted into meadows due to the progressive abandonment of the semi-subsistence economy from the end of the 19th century onwards (Puente 1992, 268).

1900-2000s*Declining meadows in Norway, Sweden, Switzerland, Italy and Spain*

The 20th century saw dramatic changes in European agriculture overall, related to technological innovations, industrialisation, falling prices and market shifts with a change towards more meat-based diets (e.g. Federico 2009). Of the countries studied in this paper, countries not affected by communist regimes largely exhibit similar patterns of meadow decline during this period connected to this. In Sweden, meadows declined drastically during the 20th century due to agricultural mechanisation and the introduction of artificial fertilisers. The rapid disappearance of the pre-industrial agricultural landscape eventually led to traditional hay meadows being recognised by ecological research. Consequently, since the 50s meadows gradually became objects of nature conservation rather than part of regular agricultural practices (Lennartsson & Westin 2019). In Norway, mechanisation led to the abandonment of many outland meadows in remote or steep areas unfit for modern machinery, and more accessible meadows tended to be transformed into intensified use through ley cultivation (Kruse et.al 2023). Switzerland displays a similar gradual decline of the species-rich meadows due to increasing use of fertilisation, both manure and artificial fertilisers (Bosshard 2016). In Italy, meadowlands have decreased since the 1960s, both due to depopulation in the Alpine and Appenine areas coupled with meadow abandonment and less animals, and in the increasing practice of feeding lowlands cattle with ensilage and less fresh fodder varieties (Lupatelli 2021). In Spain, the management of meadowland also changed, a process that is related to farm abandonment and an aging rural population. In general, those meadows close to villages are still today intensively used, while the distant ones – especially in mountain areas – mowing has often ceased and only grazing is practiced, which implies important changes in their botanical composition. There are also heritage consequences since many stone walls and huts for animal shelter and hay storage have been left unmanaged (Fillat et al. 2008).

The effects of the communist regimes in Latvia, Estonia and Poland

The period between the 1900s -2000s was a particularly tumultuous time for Estonia, Latvia and Poland. Whilst all countries suffered from the World Wars that raged across the continent, these three countries underwent significant regime changes that impacted how agriculture was conducted.

Before the onset of communism, Latvia and Estonia became independent in 1918, and the Baltic German manor lands were nationalised. In Estonia, estates were subdivided into small family farms under the 1919 Land Law (Maandi 2010). Clover cultivation grew rapidly as dairy farming became profitable, and horse-driven mowers led to the removal of trees from meadows. By 1939, meadows covered nearly 30% of the land, but fewer than 2% were improved (Riigi Statistika Keskbüroo 1940). In Latvia, nationalisation of manorial lands and land reforms led to the development of a small-scale mosaic landscape of small farms with connected arable fields, meadows and forests (Melluma 1994; Zariņa 2013). Agricultural lands including meadows expanded in relation to this (Melluma 1994).

World War II led to the decline of meadows, with Soviet land nationalisation, deportations, forced collectivisation and mechanisation. Wetland drainage and meadow disappearance accelerated in the 1950s (Tomson et al. 2016; Angelstam et al. 2005; Melluma 1994). Fields were consolidated, mechanisation increased, and many wet meadows were abandoned and overgrown by forest (Angelstam et al. 2005; Melluma 1994). Despite some coastal meadows being grazed and some larger wet hay meadows being retained, land reclamation intensified in the 1970s-80s, with the drainage of the fens (Keišs 2003; Zariņa and Vinogradovs 2019).

After independence in 1991, land ownership was restored, but many small farms became unviable, and lands were abandoned (Storie and Külvik 2019; Reihmanis and Borgegård 2011; Ruskule et al. 2013). Larger agricultural holdings took over the best farmlands, and natural meadows overgrew. In Estonia, the Pärändkoosluste Kaitse Ühing (Estonian Seminatural Community Conservation Association) began inventories in 1997 to restore and protect seminatural meadows, as a response to the decline. National schemes for meadow habitat maintenance were implemented in the late 1990s in Latvia and Estonia, but agricultural decline continued until the EU accession in 2004.

The influence of the communist regime on agricultural land and land dwelling in Poland did not consist in expelling private ownership. Former large private entities were eliminated, but small and medium-size private farms were allowed to operate. Generally, most of the green crop areas remained in small-holder ownership, however, in several regions (mainly in the north and north-east of the country), new collective, state-owned farms managed part of the meadows with varied economic outputs. During the communist era vast stretches of meadows and wetlands were drained. Meadows though increased in size in Poland between WWII and 1970s, but they decreased afterwards (Olszewski 1985). The widespread decline in

pastures observed in Central Europe during the 20th century, followed the similar trajectory elsewhere albeit at a slower pace (*e.g.* Hejcman et al. 2013; Tokarczyk 2017; Zarzycki and Korzeniak 2013).

Current state of meadows and the role of subsidies

Norway

Hay meadows are an acutely endangered habitat in Norway due to the decline of traditional feed harvesting. Consequently, they became a “selected habitat type” under the 2011 Nature Conservation Act (Miljödirektoratet 2023). A 2009 national action plan, set to continue until 2037, aims to preserve the habitat’s national range and species diversity.

While efforts have secured several individual sites (Byrkjeland et al. 2007), long-term preservation of national variation remains at risk. By 2021, approximately 4,000 ha across 3,590 localities were mapped (Svalheim 2022). However, management grants currently show a lack of representation from mountainous and northern regions (Bele et al. 2024). The overarching goal remains improving and securing the habitat across its entire natural range.

Sweden

In Sweden, meadows are no longer used for fodder production, which now occurs almost exclusively on arable land. Instead, they are valued for their biodiversity, with EU subsidies playing a key role in their preservation. Between 2000 and 2022, subsidised meadows increased, mainly due to the restoration of wet meadows in northern Sweden (Sveriges miljömål 2024). However, EU subsidies for wet meadows were abolished in 2023, and a national replacement system has yet to be implemented (Naturvårdsverket 2024).

Estonia

EU subsidies and the Natura 2000 network have stabilised Estonia’s meadows, with 130,000 ha in 2020, 88,000 ha of which are protected (Keskkonnaamet 2021). However, these measures have slowed, but not stopped, meadow loss. Following post-independence fragmentation of collective farming units, Estonia’s agriculture has rapidly concentrated and specialized in the 21st century, making meadow preservation reliant on active conservation efforts.

EU-funded projects like LIFE for alvars have restored 2,500 ha, yet Natura 2000 does not cover all traditional meadow types, particularly species-poor paludified and dry oligotrophic meadows. Farmers avoid managing wet meadows due to the need for manual labour, and pasturing maintains many

meadows but does not restore species composition. Additionally, many protected dry meadows are former Soviet-era fallows, not long-term meadows.

Latvia

Latvian meadows maintain high cultural value, with growing importance in ecotourism, bird watching, and herbal tea production (Storie & Külvik 2019; Zigmunde et al. 2016; Reihmanis & Borgegård 2011; Ruskule et al. 2018). While traditional herding has recently vanished, biologically valuable meadows have been identified and are now primarily grazed, with only a few being mowed for hay. However, rigid regulations in river valleys – requiring land-owners to own their own cattle – can hinder collaboration with conservation groups (Johansson 2005; Reihmanis & Borgegård 2011). Recent “Grasslife” projects have since improved biotope management (Grasslife 2025).

EU membership introduced new financing, increasing officially designated meadowland, but minimal management requirements limited the actual impact on biodiversity (Bell et al. 2009; Grunberga 2008). Specifically, subsidies often mandated mowing without requiring the removal of grass, a practice essential for maintaining species diversity (Rūsiņa, Auniņš & Spuņģis 2017; Zariņa et al. 2018)

Poland

Nowadays, Polish agriculture faces the tendency to graze milk cattle for only short periods of time and are mainly sustained by fodder during a large part of the year (Wasilewski 2009). Furthermore, fodder has also been increasingly commercialised, with less fodder produced on the cattle farm. In consequence, this decreases the importance of meadows. Semi-natural meadows are thus disappearing from the Polish landscape due to diminishing traditional extensive land use and are dependent on protection measures (Burczyk et al. 2018; Pawlaczyk and Jermaczek 2008; Zarzycki and Korzeniak 2013). Nevertheless, there are still some regions representing a typical free-range cattle management in the meadow pasture system (especially, in the north-east part of the country and in the Noteć River catchment area in the west).

Switzerland

Despite biodiversity and landscape payments, Swiss species-rich meadows are nearly extinct, largely replaced by intensive agriculture (Bosshard 2016). Conversely, irrigated meadow remnants are now protected under the UNESCO World Heritage “Traditional Irrigation” (Tanner et al. 2025). Although not in the EU, Switzerland supports grassland through various direct payments: area-based subsidies (higher in mountains), biodiversity payments for extensively managed or high-quality meadows, landscape quality funds for

traditional features like terraces, summering payments for alpine grazing, and extra support for steep or remote slopes (FOAG). Conservation funding specifically targets extensive (unfertilized) and low-intensity meadows, with both strictly requiring mowing (Schweizerische Eidgenossenschaft 2013)

Italy

Meadows in Italy are under threat, especially in marginal and mountainous areas. Subsidies (Agri-Environmental Measures) play a key role to promote maintenance of grasslands, low-intensity mowing/grazing, biodiversity-friendly practices (Lomba 2020), but are often not efficiently targeted or implemented. Uptake is regionally variable and the effect will depend on regional strategies, as Italy has a decentralized governance system. Sometimes CAP favours intensified agriculture rather than truly sustainable practices (Marini 2009). In some cases, payments are based on area rather than outcomes, which can discourage the most biodiversity-friendly practices. The lack of long-term planning, monitoring, and alignment between national and regional levels also reduces their effectiveness (Branduini 2023). Future effectiveness depends on better ecological targeting, monitoring, and integration of cultural landscape values into policy (MASAF 2022).

Spain

In Spain, the contemporary reduction of meadowland area is intended to be reversed through a series of subsidies included in the Common Agricultural Policy, which are known as “eco-schemes” (Regulation UE 2021/2115, article 31). These eco-schemes support hay meadows through two practices: sustainable mowing and the establishment of biodiversity islands (Real Decreto 1048/2022). Two main reasons given for preserving hay meadows are: on the one hand, that they constitute a valuable resource for extensive livestock farming, which provides quality food products obtained under high animal welfare conditions; on the other hand, hay meadows provide a habitat for a multitude of species of fauna and flora (Habitat Directive 92/43/CEE).

Discussion

While the results of the synthesis of meadow history and definitions outlined above reveal substantial national and regional differences, there are also substantial overarching similarities in how meadow transformations across Europe have played out (see Table 2). In this discussion section, we elaborate further on these common points.

This study largely shows patterns similar to those from earlier research such as Kruse et al. (2023) and Lennartsson et al. (2016), with meadow decline distinctly tied to agricultural intensification, albeit in different contexts driven by market shifts, agricultural development, demography and political change. As noted by Lennartsson et al. (2016), the specific contexts in which meadow transformation occurred varies, which is clearly shown in the countries studied here. This study also emphasises the varied roles that meadows play today, as shown by Kruse et al. (2023) not only as part of ecological conservation, but also as a cultural heritage and playing roles in alternative economic activities, such as tourism. What our study contributes to this discussion is a further consideration of how the longer history of meadows plays into these processes, also including how definitions and thus perceptions of what is a meadow or not have changed over time. These are important aspects if we want to trace the trajectory of meadow change and evaluate the potential futures of European meadow systems. Below, we elaborate further on these points and also discuss some potential policy implications.

On shifting definitions: from production to conservation

An important result from the paper is the general trend of the meadow transforming from an agricultural necessity to an object of nature conservation and aesthetic value. Historical definitions in the studied countries, apart from Poland, are tied distinctly to the practice of mowing (see Table 1). In modern times, the definitions have broadened considerably, either colloquially or scientifically, often to cover more management practices such as grazing and generally with a much stronger focus on the vegetation itself. The only exception here is Switzerland, where the meadow definition is still more strictly tied to management practices. Overall however, this reflects a broader shift from meadows as the result of specific management practices towards a conservation focus where the meadow is primarily seen as a vegetation type. While this reflects the overall trajectory of change in the practical management of meadows across most parts of Europe, it is also a semantic drift that risks obscuring the historical management practices that originally created these habitats.

Furthermore, the colloquial perceptions of meadows particularly in Sweden, Norway, and Latvia adds a critical dimension to these challenges. When public perception is dictated by aesthetics – labeling any flower-rich field a ‘meadow’ – it risks ‘management blindness,’ where the ecological necessity of traditional labour is overlooked. This semantic drift may ultimately undermine the legitimacy of subsidies. If meadows are viewed as static natural features rather than products of active management, the political will to fund labour-intensive conservation may diminish.

Common trajectories and drivers of change

Despite regional differences in climate, language and diversity of agricultural practices, the historical development of meadows follows a remarkably consistent trajectory across the studied countries. Meadows evolved from early leaf-fodder collection to scythe-based haymaking in the Iron Age (although the exact dating varies) as a functional and integrated part of the agricultural economy, playing a part in the establishment of permanent fields through the practice of stalling and collection of manure. Although with regional variations, this system remained relatively stable for centuries until the Agricultural Revolution of the 18th and 19th centuries, when technological development, land enclosures and the introduction of sown fodder crops on arable land transformed the meadow landscape. In most of our studied countries a shift towards intensified cattle production was initiated in the late 19th century as a result of changing agricultural markets, which also entailed a shift from semi-natural meadows to other kinds of fodder production.

During the 20th century, the drivers of meadow transformation diverged between the Eastern Bloc and the rest of Europe. In Western and Southern Europe, market forces, mechanisation, and rural depopulation drove the abandonment of steep and remote meadows, while accessible areas were intensified into high-yield leys. Conversely, in the Baltic states, communist land consolidation, mechanisation, drainage and conversion of meadows into leys was followed by widespread abandonment and reforestation of unproductive marginal lands. Communist Poland followed another path; meadows increased until the 1970s and declined slowly thereafter, as smallholders retained private ownership. Despite these regional differences, a shared theme across all communist regimes was the execution of vast drainage projects (1950s-1980s) that converted wet meadows into arable land. Currently, since the historical meadow plays a very limited role in the overall agricultural economy the survival of traditional meadows across Europe is almost entirely dependent on political decisions and financial subsidies such as the EU's Common Agricultural Policy (CAP) and national action plans.

The historical trajectories of meadows across Europe thus reflect the sensitivity of land use to societal and technological developments, where market forces and political regimes strongly shape the outcome in the landscape. Historically however, meadow management was primarily driven by internal agricultural necessity – the production of fodder and manure. The results of this paper suggest a fundamental shift where meadows have become 'decoupled' from the primary agricultural economy and instead function as parts of a 'policy-driven landscape.' While still holding economic value

for landowners, this value is now external and administrative, derived from conservation subsidies rather than market demand for hay. Consequently, the future of European meadows is dependent on political priorities and agri-environmental schemes.

Managing the policy-driven landscape: policy implications

This paper demonstrates that meadow definitions and historical transformations are inextricably linked. The shift toward broad, vegetation-focused definitions reflects a transition from meadows as functional components of the agricultural economy to their current role in a ‘policy-driven landscape’. Preserving these habitats without accounting for their diverse land-use histories and regional variations poses significant risks to conservation success. Therefore, we suggest the following two policy implications:

1: Re-prioritising process over vegetation end-goals. While current definitions and related policies often treat specific vegetation patterns as a goal, species-rich meadows are the legacy of labour-intensive practices like traditional scythe mowing. These habitats have historically endured climatic and agricultural shifts through active management. As Member States now develop plans under the EU Nature Restoration Law (Regulation 2024/1991), restoration must be explicitly linked to cultural traditions. Therefore, policy should provide stable incentives for the management process itself. By ensuring the ongoing continuity of traditional haymaking, policy can better secure the ecological long-term continuity for these habitats to thrive, also under future changes.

2: Accounting for regional historical legacies. Our comparison suggests that ‘one-size-fits-all’ policies often fail to address regional specificities and the diversity of meadows across our studied countries, and Europe in general (see Figure 1). While the current CAP attempts to accommodate national variations, critiques of its standardising and homogenising effects persist (Dahlström et al., 2013; Cuadros-Casanova et al., 2023). For instance, while agriculture throughout most of Europe undergoes concentration to larger farms, policies in former Eastern Bloc countries must navigate the legacies of collectivization, drainage and independence. Southern Europe faces acute rural depopulation, a process which also strongly affect the Baltic countries. In Poland and Romania, the prevalence of smallholders suggests that supporting small-scale farming structures may be as vital as direct environmental payments (Dahlström et al., 2013). Consequently, long-term meadow conservation requires looking beyond ecological targets to the socioeconomic characteristics of each region. This is particularly complex where biodiversity-rich landscapes currently rely on “poverty traps” or lack of alternative opportunities, as seen in Transylvania (Hartel et al., 2023).



Figure 1. Collage illustrating the diversity of contemporary meadows in the studied countries. a) Steep meadow with drying racks in Ulvsund in the municipality of Voss in western Norway. Photo: Ellen Johanne Svalheim. b) Mowing on a former flood-meadow in the Culture Reserve of Stensjö By, County of Kalmar, Sweden. Photo: Hjalmar Croneborg. c) Coastal meadow in Matsalu, Estonia. Photo: Pille Tomson. d) Biodiverse meadow in the hilly uplands of the Vidzeme region of Latvia. Photo: Joanna Tamar Storie. e) Hay meadows in The Bug River Valley, eastern Poland. Photo: Hanna Wójciak. f) An irrigated meadow in Switzerland, now part of the UNESCO world heritage. The water is directed onto the meadow. g) An abandoned meadow and hut in Cantabria, Spain. Photo: Iago Vázquez. h) A water meadow in Italy, Abbiategrasso, Ticino Park. Winter submersion melts the snow. Photo: Paola Branduini.

Conclusion

This study has synthesised the history of meadows and their connected definitions across eight countries in Europe. The history of the definition of “meadow” follows a rather consistent pattern across Europe, shifting from practice-oriented towards vegetation-oriented definitions, albeit with some exceptions. In many countries, the inclusion of grazing and pastures under the term “meadow” represents a semantic drift which risks obscuring the historical practices behind present day meadowlands.

When it comes to the historical transformation of meadows in Europe, it is clear that meadows originate out of the necessity for winter fodder and the production of manure, where its introduction was made possible through the Iron Age scythe revolution. Through many centuries, meadows played an important but varying part of the agricultural system in Europe, and its decline can be primarily tied to the introduction of sown fodder and artificial fertilizers. However, our study also highlighted the differences between the East Bloc and the rest of Europe in the 20th century, where meadow decline in the West was driven primarily by technology, market forces and rural depopulation. In the former East Bloc, collectivisation and large-scale drainage projects were the primary causes. Overall, the meadow has now become decoupled from primary agricultural production and should now be considered as a part of a policy-driven landscape, dependent on subsidies rather than market demand.

We also suggest that policies aimed at meadow preservation in Europe should prioritise meadow management as a labour process above chasing botanical outcomes, and that European policies that account for regional differences and heritages are sorely needed. In order to secure the biological and cultural diversity of Europe, stable incentives that recognise meadows as essential parts of the European cultural landscape and multidirectional encouragement of farmers still managing traditional meadows are necessary.

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Annex

Table 1. Compilation and summary of meadow definitions and etymologies from the studied countries. Sources: see the text.

Country	Native Term(s)	Historical/Original Definition	Current Status / Shift in Meaning
Switzerland	Matte	Related etymologically to mowing	Largely replaced by the term Wiese, still with mowing definition intact
Estonia	Heinamaa, Niit	Historically distinguished from pasture (karjamaa) by use (mowing), not vegetation. Niit (the modern term) originates from niitma ("to cut hay").	Niit now refers broadly to all types of semi-natural grasslands (both mown and grazed) in contemporary vegetation classification.
Italy	Prato	Linked specifically to fodder production through mowing.	Definitions have remained relatively consistent since at least the 1930s; still refers to land covered with grass (spontaneous or sown) used for cattle food (fresh or dry).
Latvia	Pļava	A subcategory of zālājs (grassland ecosystems), characterised by grass, sedge, and herbs removed through haymaking.	In everyday speech, often confused with lawns. The term dabiskā pļava (natural meadow) is now used to distinguish traditional meadows from modern grasslands/lawns.
Norway	Eng	Historically referred strictly to land mown for fodder, only grazed after the hay harvest.	The definition has expanded to "a piece of land with grass, often used for mowing or pasture"
Poland	Łąka	Originally referred to periodically wet land with grass, flowers, and sometimes trees. Mowing became part of the definition in the 19th century.	Today, the term is broader and can also refer to pastures, general sedgeland and arable land with grass.
Spain	Prado	Historically linked to mowing, with grazing only occurring after the hay harvest.	Shifted towards a broader conservation definition including both mowing and grazing. However, the Royal Spanish Academy defines it as "pasture on irrigated or humid grasslands".
Sweden	Äng	Historically referred strictly to land mown for fodder, only grazed after the hay harvest.	Modern colloquial definition emphasizes rich flora without mentioning management practices. In conservation, it still implies unploughed/mown land.

Table 2. Summary of the main historical developments connected to meadow land use in the studied countries. Sources: see the text.

Country	Middle Ages to Early Modern	Agricultural Revolution (c. 1700–1900)	20th Century	Current State
Norway	Variety of meadows, both outlying land and infields. 12th–13th C population growth led to stricter regulation of commons; flexible ownership in remote fens/bogs.	Increasing land pressure. 19th C introduction of sown meadows (kulturreng) and artificial fertilizers. Traditional methods remained in use in steep terrain	Mechanization caused remote meadow abandonment and intensification of accessible areas via ley cultivation.	Endangered habitat status; National Action Plan (2009–2037) targets regional management gaps.
Sweden	Regional differences: dry meadows in the south and wet meadows in the north; transition to manuring and fertilization of meadows starting in the north.	Post-1750 gradual but slow shift to fodder on cultivated fields; late 19th C commercial dairy drive accelerated conversion to fodder on arable land.	Drastic decline via mechanization/fertilizers; shifted from agricultural use to nature conservation (1950s).	Biodiversity focus via EU subsidies; 2023 funding cuts for wet meadows create uncertainty.
Estonia	Meadows supporting three-field systems; regional differences between coastal wooded meadows and eastern floodplains.	19th C shift towards animal husbandry, clover cultivation, drainage; increasing peasant ownership led to 1.8M ha peak in semi-natural grasslands.	Post-1918 Farm expansion and increased clover cultivation, followed by Soviet collectivization and drainage leading to meadow decline; post-1991 abandonment	Stabilization via Natura 2000; ongoing loss of labor-intensive wet and species-poor traditional types.

Country	Middle Ages to Early Modern	Agricultural Revolution (c. 1700–1900)	20th Century	Current State
Latvia	Extensive land use system. Meadows important for manure; manor expansion of arable land unto peasant meadows and pastures	19th C manorial intensification, clover fields and grassland improvement. Meadows tied to peasant farming.	Similar to Estonia above	Value shift to ecotourism; EU subsidies increased the designated meadow area but lacked proper biodiversity-focused management.
Poland	Primarily river valley meadows supporting the three-field system. 16th C population rise with arable expansion on drained meadows and meadow expansion into cleared forests	19th C peasant enfranchisement and arable expansion; shift to cattle and milk production drove wetland drainage and meadow expansion on former pastures	Retained small-holder ownership under Communism. Widespread drainage; meadow acreage increased post-WWII until 1970s, followed by decline.	Decline due to commercial fodder; traditional free-range systems persist in NE and Noteć regions.
Switzerland	Meadows more rare in the three-field system. 14th–15th C shift toward livestock with meadow expansion via steel scythes and alpine valley irrigation.	19th C agricultural modernisation led to meadow dominance; introduction of sown artificial and species-rich fromental meadows.	Sustained decline of species-rich habitats due to intensified organic and artificial fertilization.	High extinction risk countered by tiered biodiversity payments and UNESCO status for irrigation.

Country	Middle Ages to Early Modern	Agricultural Revolution (c. 1700–1900)	20th Century	Current State
Italy	Cistercian marcite water meadows (winter submersion) paralleled with wetland reclamation. Expansion by 16th C; integration of mountain pastures and maize rotations.	Late 18th C enclosures with expanding sown and artificial meadows; marcite water meadow expansion on the Milanese plain	Post-1960s decline via mountain depopulation; lowland shift to intensive silage.	Marginal areas threatened by inefficient, area-based subsidies and decentralized governance.
Spain	Initially limited meadow area. Early modern meadow expansion driven by population growth, market and declining transhumance; focus on winter fodder.	19th C dairy specialization (silage/Holstein); conversion of grainlands as subsistence farming declined.	Rural depopulation led to intensification near villages and cessation of mowing in mountain regions.	Preservation countering meadow reduction driven by CAP “eco-schemes” for biodiversity and high-welfare livestock farming.