Good Pastures, Good Meadows: Mountain Farmers' Assessment, Perceptions on Ecosystem Services, and Proposals for Biodiversity Management

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Abstract: An ongoing decrease in habitat and species diversity is occurring in many areas across Europe, including in grasslands in mountain areas, calling for adapted biodiversity management and measures. In this context, we carried out 79 interviews with grassland farmers in five alpine mountain regions in Germany, France, Austria, Italy, and Switzerland. We analyzed farmers' perceptions about the functions and services of their grasslands, how they qualify "good" grasslands, which grassland management practices have changed over the last 10 years, and proposals to increase species diversity on the farm. They related them primarily to cultural ecosystem services, secondly to provisioning services, and thirdly to regulating and supporting services. Good pastures or meadows were mostly related to composition, quality of forage and productivity, structural criteria, and certain characteristics of soils and topography. The measures for increasing biodiversity that were most frequently proposed were upgrading of forest edges, planting hedges or fruit trees, less or late grassland cutting, reduction or omission of fertilization, and more general extensification of farm productions. Factors hindering the implementation of these measures were mainly increased workload, insufficient time, and a lack of financial means or support to cover additional costs for biodiversity management. These factors have to be taken specifically into account for future policies for enhanced biodiversity management of grasslands, also beyond mountainous areas. Overall, we found that farmers have good but varying knowledge about biodiversity management of their grasslands, but also different perspectives on how to improve it. Here, local initiatives that bring together farmers and flora or fauna specialists to exchange knowledge could be designed and used in participatory pilot schemes to enhance the implementation of improved biodiversity management.

Keywords: agri-environment measures; alpine grasslands; farmers' knowledge; grassland biodiversity

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1. Introduction

An ongoing decrease in habitat and species diversity is occurring in many areas and countries in Europe. Major biodiversity loss is often related to agriculture, including, among other things, insect and bird populations, and causes disrupting ecosystem functions, such as pollination and pest control [1–5]. Across the European Union, a significant proportion of wildlife habitat continues to deteriorate, with more than three quarters of all wildlife habitat assessments indicating an unfavorable conservation status [4], including habitats in agricultural landscapes. Regarding non-bird species, assessments at the European Union level show that 60% have an unfavorable conservation status. For wild bird species, 15% are near threatened, declining, or depleted, and a further 17% are threatened. The decline in common and widespread bird species is also dramatic [6], and a downward trend for farmland birds is apparent [1]. A decline in common species is also reported for insects [7]. Sustainable agricultural management is of paramount importance to prevent their complete extinction and to maintain relevant ecosystem functions such as pollination and pest control [1,4]. For example, more than 10% of the average local bee species diversity has been lost in more than 50% of all EU27 countries, and two thirds of all countries have lost over 5% of their average local functional and phylogenetic bee diversity [3]. These lower diversities are generally stronger for pastures and higher-intensity cropland compared with semi-natural/natural vegetation. Woodcock and colleagues [8] also showed that exposure to neonicotinoids, among other agricultural practices, is associated with higher rates of bee population extinction.

Biodiversity in mountainous areas might be considered as less threatened, as agricultural production is generally less intensive there and also many larger areas are still (semi-)natural, with some of them protected. Regarding grasslands specifically, the highest number of plant species generally is found in unfertilized, sporadically mown meadows [9–12]; and extensively cultivated grasslands in central Europe are a hotspot of biodiversity [13]. With increasingly intensive land use, the number of plant species decreases, and once plant species richness has declined, a regeneration may require a long period [13,14]. Due to faster and higher growth in fertilized grassland areas, most of the sunlight is already absorbed in the upper canopy layer and only a small amount of light gets through to the lower layers [15,16]. As a result, a few competitive species come to dominate, while stress-tolerant species disappear [17]. Furthermore, frequent mowing acts as a continuous disturbance, allowing only those plant species to grow that have either very short life cycles or can clonally reproduce [18]. On the other hand, abandonment of grasslands can also lead to a decrease in plant species richness [10,11]. Without mowing or grazing, the plant species composition undergoes a fundamental change: tall competitive species become dominant, forcing slow-growing species in the lower canopy layers to gradually recede [15]. In addition, the inhibition of seedling recruitment by a litter layer may be a reason for decreasing species numbers in abandoned meadows and pastures [19]. Poor plant diversity in grasslands also means reduced habitat quality for a variety of animal species [14]. Grassland abandonment also causes species' loss in groups such as oribatid mites, grasshoppers, bugs, and butterflies [20].

Most mountainous grasslands are managed by farmers for livestock production. Typical management includes different mowing and grazing regimes, as well as fertilization, and for some farmers also sowing of species in temporal grasslands. The management is first of all carried out to produce a sufficient amount and quality of fodder for livestock. On the other hand, there are societal expectations that mountain agriculture provides other ecosystem services [21]. In a study by Pecher and colleagues [22], about 90% of interviewees considered mountain agriculture to hold special significance for the conservation of tradition and cultural heritage, provide protection against natural hazards, and maintain the traditional cultural landscape. A total of 80% of the interviewees considered it important for the maintenance of biodiversity and for supplying a human population with high-quality food. To support these services, in general, 86% of the interviewees were in favor of giving public financial support to farmers. However, more than half of those added the stipulation that they would do so only if the areas are ecologically valuable. So, if society expects mountain farmers to contribute to biodiversity conservation and other ecosystem services, production goals and the economic viability of the farms in such regions need to be reconsidered.

This paper analyzes mountain farmers' perceptions about their grasslands by, first, looking at the function and services they see for their grassland and, second, identifying which criteria they use to qualify their grasslands as "good" pastures and meadows. In this context, pastures are understood to be grassland areas that are grazed by livestock, while meadows are areas mown to produce grassland fodder for feeding in the barn. Further, the study investigates which management practices farmers apply, especially in relation to biodiversity management, and what farmers propose to potentially improve biodiversity management on their grasslands. This investigation also includes factors, including socio-economic ones, that hinder and facilitate the adaptation of existing practices or the implementation of new ones. Finally, we discuss which policies should support farmers to improve biodiversity management of mountainous grasslands.

2. Materials and Methods

2.1. Study Areas

The study was carried out in five regions of the Alpine mountain range: the regional natural park of the Vercors in France, the Canton of Lucerne in Switzerland, the Upper Allgäu in Germany, South Tyrol in Italy, and the federal state of Carinthia in Austria (Figure 1).

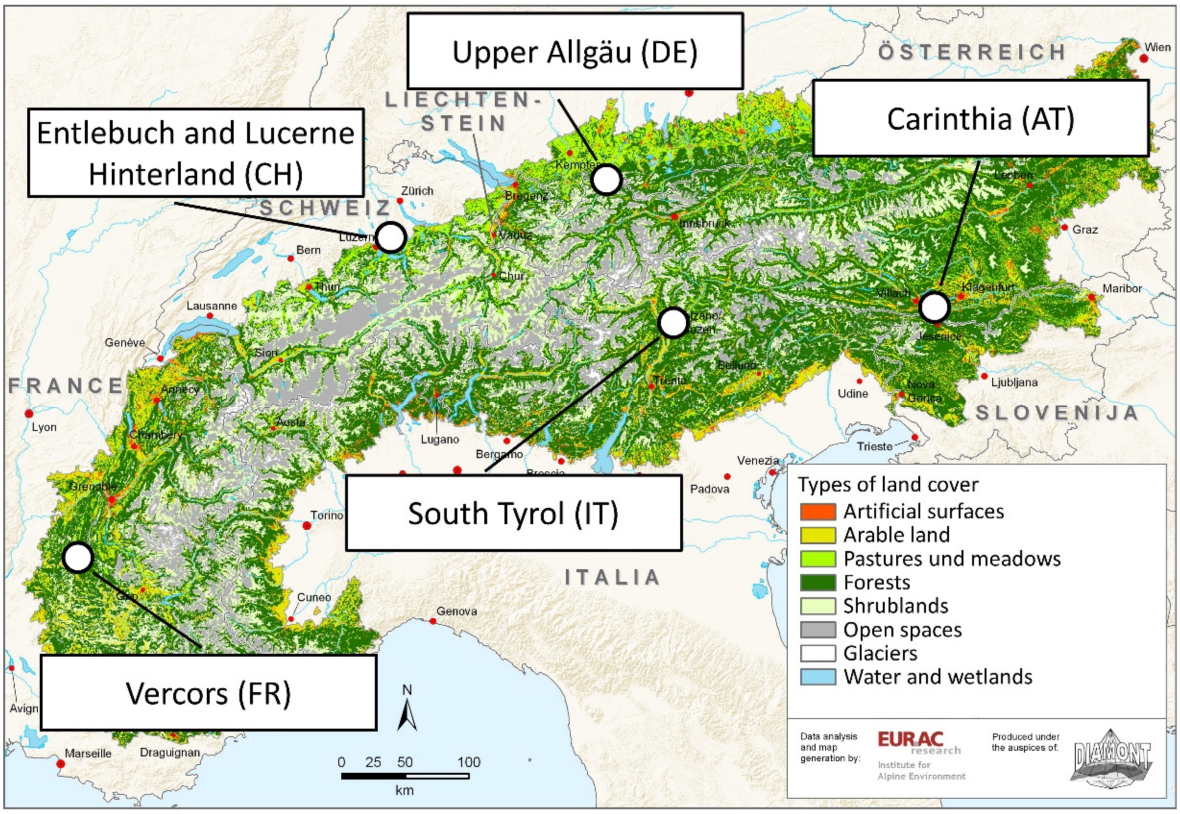

Figure 1. Study areas locations in Austria, France, Germany, Italy, and Switzerland.

2.2. Interviews with Farmers

A questionnaire was jointly developed in English by all project partners. After a pre-test with farmers, the questionnaire was adapted and translated to French and German to allow for interviews to be conducted with the farmers in their native languages. Interviewees were recruited either via addresses provided by the regional chambers of agriculture, regional advisory services or other institutions, or via announcements in the local press or agricultural journals with a call to participate in the survey. Our intention was to engage farmers on a voluntary basis and to have a diversity of farmers' profiles in the sample of interviewed farmers. The main selection criteron was the presence of grassland on the farms. Then, the purpose was to have a diversity of farm types (in terms of farm size and farm production systems). A second objective was to interview both farmers who subscribed to agri-environmental measures related to grassland management and farmers not involved in such schemes.

In total, 79 interviews were carried out with farmers in the five countries. In Germany and France, 15 interviews were conducted, 14 each in Austria and Italy, and 21 in Switzerland. Interviews typically lasted 1 to 2 h, occurring on the interviewees' farms. The structured questionnaire included both closed (the majority of questions) and open-ended questions, outlining general farm characteristics, farming practices, farmers' challenges in mountainous farming, biodiversity management, knowledge and experience in agri-environment measures, and needs for training. The results of the interviews were translated to English and integrated into a common database.

Content analysis was performed on answers to the open-ended questions. For this paper, this analysis concerned questions related to farmers' thoughts, concerns, and statements regarding the function and services of pastures and meadows and their management, as well as farmers' suggestions for potential future measures and management. Key terms or words in farmers' responses were noted with the respective open-ended questions. Next, key terms and words were grouped, if possible, and categories were identified such as "high diversity" or "good quality". This categorized data set was further quantitatively analyzed with descriptive statistics for some questions. The ecosystem services mentioned by farmers were classified according to Haines-Young and Potschin [21].

2.3. Farmers, Farm Characteristics, and Major Farming Orientation

All farms were situated between 520 and 1810 m elevation above sea level (a.s.l.) with a median of 860 m a.s.l. (Table 1). Within this range, a high concentration of farms was situated between 800 and 900 m a.s.l. South Tyrolean farms were located at significantly higher elevations, which is due to the inner Alpine position on the southern slope of the Alps and the thus climatically more favorable agricultural situation. At lower elevations, South Tyrol is mainly home to fruit and wine-growing areas [23]. The mean utilized agricultural area (UAA) for the surveyed farms was 45 ha; however, half of the farms had a UAA below 37 ha. The smallest farm had a UAA of 3 ha and the largest farm a UAA of 210 ha. The largest farms were found in the Vercors study area in France, with a mean of 96 ha, and the smallest in the Italian (25 ha) and Swiss (28 ha) study areas. Grassland area averaged 94% of the UAA.

Table 1. Farm characteristics of the 79 studied farms in the study areas of five different countries. Numbers in parenthesis are minimum and maximum values.

	Vercors, France	South Tyrol, Italy	Upper Allgäu, Germany	Carinthia, Austria	Entlebuch, Switzerland	All
Elevation of farm (m a.s.l.; median (min–max))	840 (700–1070)	1393 (848–1810)	850 (650–1080)	921 (520–1185)	860 (703–1200)	860 (520–1810)
Total farm area (ha; mean (min–max))	98 (32–210)	38 (5–151)	56 (8–106)	36 (23–152)	58 (17–84)	58 (5–210)
Total utilized agricultural area (ha; mean (min–max))	96 (32–210)	25 (3–126)	49 (8–103)	34 (8–116)	28 (12–84)	45 (3–210)
Semi-intensively to intensively used permanent grassland (ha; mean (min–max))	46 (0–70)	12 (0–24)	27 (6–62)	13 (0–29)	22 (0–39)	24 (0–70)
Extensively used permanent grassland incl. alpine pasture (ha; mean (min–max))	37 (0–110)	12 (0–108)	23 (0–92)	20 (0–94)	6 (0–54)	19 (0–110)
Arable land (ha; mean (min–max))	13 (0–30)	0.3 (0–3)	0 (-)	1 (0–9)	0.5 (0–3)	3 (0–30)
Other (e.g., forest, alpine grasslands (ha; mean (min–max))	2 (0–20)	13 (0–53)	7 (0–20)	37 (0–103)	8 (0–25)	13 (0–103)
Age of farmer (mean years)	50 (31–59)	50 (29–68)	46 (26–60)	41 (33–50)	46 (27–56)	46 (27–68)

The major land use type on the farms was semi-intensively to intensively used permanent grassland (high grazing or cut intensity, high fertilization rate). The largest extensively used grassland areas (low grazing or cut intensity, no to low fertilization rate) were an average of 37 ha on French farms, followed by German (23 ha) and Austrian (20 ha) farms. The area of cropped land was higher only in the region of Vercors, whereas in the other case study regions, no or only smaller land areas were used for cropping. Other land uses, such as forests or litter areas, were relatively important on some farms in Austria and Italy. For more details, please see [24].

The average farmer age was 46 years old; however, there was a wide age range, with the youngest being 27 and the oldest being 68 years old (Table 1). The typical farmer in this study had managed the farm for 10 to 25 years (the complete range is 1 to 42 years). Half of those interviewed were part-time farmers with an additional non-farm employment. Farm managers were mostly men (82%) and some women (10%). The remaining 8% are couples who co-manage the farm.

Most farms had livestock production; some farms combined several types of production, while only one was specialized in horticulture. Specialized dairy production was the most prominent type of production, involving 61% of all studied farms. In the Upper Allgäu, this figure reached 93% of the farms analyzed. Other types of production were also important, though to a lesser extent, such as cattle rearing (25% of the farms), with the majority of these farms located in Italy. Suckler cows were present on 16% of all farms analyzed. Most were found in the Austrian study area. Sheep and goat production was carried out on 13% of farms, mainly located in Vercors, France. Specialized pig or poultry production represented 6% of the farms, all located in the Swiss case study region. Farms with mixed crop and livestock production represented another 6% of the farms.

3. Results

Farmers were first asked which functions and services pastures and meadows have, for them, but also more generally for society (Figure 2). Many farmers stated that grasslands have important functions and services for the landscape. These related mainly to cultural services. The most commonly identified services were conservation of cultural landscapes, followed by the beauty of landscapes, but also their openness. Further, pastures and meadows were also stated as important for tourism and recreation, which was often related to the previously stated aesthetic landscape aspects. The two types of grasslands were also mentioned for conserving general biodiversity and species richness and, more specifically, flowers and flower richness (Figure 3).

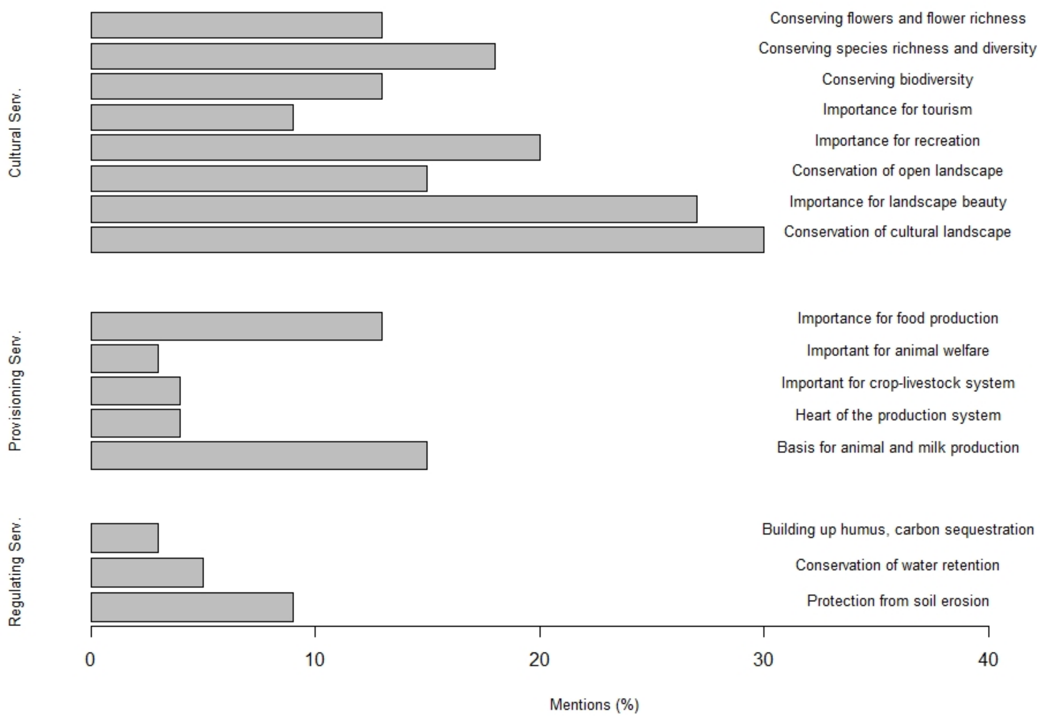

Figure 2. Functions and services (including for society) of pastures and meadows as seen by farmers in five Alpine countries (total n = 79 famers). The list includes only criteria mentioned by at least three farmers.

Figure 3. Species-rich meadow in the French Vercors study area (**left**) and grazed pasture in the Allgäu study area in Germany (**right**). Photos, A. Wezel.

Farmers commonly mentioned a second category of functions and services related to provisioning services and the functioning of their farms. These services provide the basis for animal and milk production, the heart of the production system, and are important for the crop–livestock system and animal welfare. A third category, mentioned less frequently, contains regulating and supporting services such as protection from soil erosion, water retention, and carbon sequestration.

Farmers identified many different qualities that they attribute to a good pasture or meadow (Figure 4). The most often mentioned criteria were related to composition: high diversity of species (almost the same number of farmers below or above 46 years of age) and a good grass composition, the latter more specifically for meadows. With regard to grassland quality, farmers valued good grass and fodder quality (three times more mentioned by older compared with younger farmers), good yields, and good plant growth. Farmers also stated characteristics that good pastures and meadows should not have. Here, farmers mainly specified few or no weeds, as well as no or few mice and moles in meadows. Farmers define weeds as all plant species that reduce the forage value of grassland and, in the worst case, completely devalue it. These include absolute weeds (species that are toxic to livestock, such as ragwort, autumn crocus, and bracken), space and nutrient predators (avoided by livestock, such as thistles, turfgrass, and meadow geranium), and facultative weeds that reduce the quantity and quality of forage if they are present in too high a density (e.g., common dandelion, hogweed, and woolly honeysuckle). Mice and moles are not welcomed by farmers, as their nests or molehills cause problems, especially in forage production, by contaminating the feed.

Farmers also attributed certain structural criteria to good pastures and meadows. Having a dense grass sward and good grass cover was of great importance, and, especially for pastures, access to water and shade for livestock was preferred. A last important category is related to soils and topography. Here, trampling is considered problematic on pastures. Good pastures and meadows are, for some farmers, not too steep, not too wet, and have good and dry soil.

There was variation in the criteria identified in relation to management, such as mowing, fertilization, and pasture use, but each was mentioned by only one or two farmers. Further, other various criteria were stated by farmers but also only once or twice.

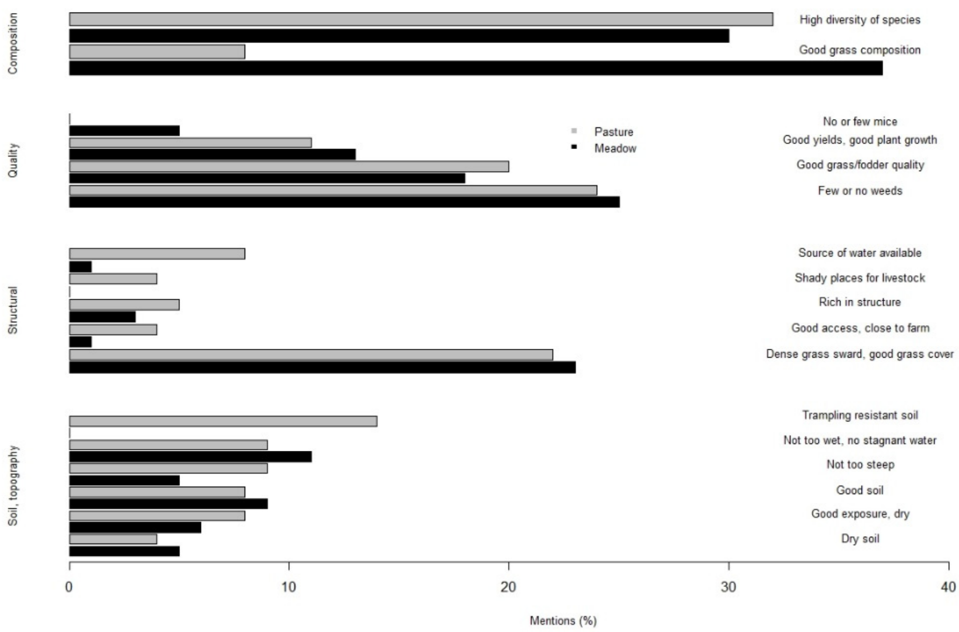

Figure 4. Criteria that farmers in five Alpine countries use to qualify a good pasture and a good meadow (n = 79 famers). The list includes only criteria mentioned at least by three farmers.

According to farmers, different practices could increase species diversity on their farms (Table 2). In particular, farmers favored extensification of meadows, and a general extensification of farm production. Here, farmers did not further specify what they meant by extensification. Several farmers mentioned late cutting of grasslands, having flexible dates, and establishing specific mowing regimes. Sowing of various and multiple species was also mentioned. Moreover, different improved pasture and manure management was mentioned, as well as improving forest hedges, planting hedges, and adding flow strips or ponds. Many farmers clearly stated, however, that they already have practices in place to increase species diversity, so they do not see a specific need to change their management.

Table 2. Practices that could be implemented to increase species diversity on the farm. Responses of farmers in five Alpine countries (n = 79 famers). The list includes only criteria mentioned by at least two farmers.

Practices Increasing Species Diversity	% of Farmers
Extensification of meadows	11
Extensification in general	3
Late cutting	6
Flexible cutting dates	3
Gradual mowing, leaving refuge areas, cutting from the center	6
Improved pasture management (e.g., less stocking, rotational grazing)	8
Planting hedges and improving forest edges	6
Sowing	5
Reduce or exclude liquid manure	5
Add flower strips or ponds	3
Maintain current practices	23
Do not know	4
No answer	13

Farmers were asked: what would be the most relevant measures for biodiversity that farmers could envisage on their farm if they were better paid for it? In response, they often identified the following practices: more frequently upgrading forest edges, planting hedges or fruit trees, less or late cutting of grasslands, reduction or omission of fertilization, and more general extensification of farm productions. To a lesser degree, sowing more different species on temporary meadows, reducing livestock stocking, and late grazing on pastures was stated. Again, some farmers said that they already have a relevant measure in place. Interestingly, farmers more frequently mentioned measures that could also be implemented outside or at the edge of their grasslands (forest edges, hedges, fruit trees), rather than changing their practices (cutting regime, fertilization, grazing regime).

In order to implement new practices or adapt existing ones in the future, it is important to know which changes in practices occurred recently, and which practices are already in place. First, almost 25% of the farmers said they had made no changes in their practices during the last 10 years (Table 3). The most relevant practices that changed were related to grassland management, fertilization, mowing, and extensification. Several farmers mentioned less fertilization or a change in fertilizer. Several farmers had changed their mowing dates, several had reduced the number of cuts, and others had increased the number of cuts. The same situation can be found for pastures. On the one hand, some farmers had reduced stocking densities; on the other hand, grazing had been intensified on some farms. The meadow–pasture ratio had also changed in both directions. More specific changes in practices were related to increased plant species in temporary grassland, establishing short-grass pastures, and changes in weed management.

Table 3. Changes in management practices of pastures and meadows in the last 10 years. Responses of farmers in five Alpine countries (n = 79 famers). The list includes only criteria mentioned by at least two farmers. The distinction between practices for intensification and extensification was added by the authors.

Changes in Practices	% of Farmers	Intensification (I), Extensification (E)
No changes	27	-
Change of grassland management	9	-
Less fertilization	8	E
Change of fertilizer	6	-
Change in mowing management of grasslands (hand-mowing, cut dates)	8	E
More frequent cutting of grasslands	6	I
Less frequent cutting of grasslands	3	E
More cutting of shrubs	4	I
Decrease in stocking density, having less heavy cattle	5	E
Intensification of pasture use	3	I
Extensification of grassland use	4	E
Change in pasture to meadow ratio (both directions)	5	-
Increase in plant species in temporary grassland	4	E
Establishment of short-grass pastures	4	I
Weed management	4	-
Reduced or no silage	3	E
No answers	6	-

Finally, farmers were asked to identify the factors that hindered and facilitated improvements in biodiversity management practices or the implementation of new biodiversity measures on their farms. Among the most mentioned hindering factors was increased workload, or more generally not having sufficient time. The lack of financial means to cover additional costs for applying certain biodiversity management practices and the need to obtain financial support for such actions were also important constraining factors. Some mentioned that economic interests competed with the environmental ones, e.g., if the meadows are used for biodiversity promotion, they would compete with the fodder production for dairy cows and milk production. Others mentioned unpredictable weather conditions that limited their ability to make informed management choices, for example, not knowing if late mowing or less frequent cutting regimes would have the expected positive biodiversity effects over the years. Finally, a few mentioned that such measures might have negative impacts on fodder quality or reduce weed control.

The main facilitating factor that farmers identified was support payments for specific biodiversity management practices that supported their farm's economic profitability. To a much lesser degree, farmers also mentioned that having more seasonal workers available, or being able to rent other land to compensate for reduced production of fodder and thus decreased autonomy of the farm, would be a facilitating factor. However, most farmers did not respond to this question.

4. Discussion

4.1. Function and Services of Mountain Grasslands

Farmers see many different services and functions of their grassland. Many farmers in our study expressed cultural services related to cultural landscapes, their beauty, and their use for recreation and tourism. Biodiversity, in terms of species and flower richness, was also considered important, as a service, but not a function. Furthermore, respondents identified multiple provisioning services such as the provision of agricultural products and forage, but less frequently noted other services and functions such as protection from soil erosion or water retention. In contrast, local residents interviewed in other studies more commonly prioritized these ecosystem services and perceived a close connection between their well-being and multiple regulating services, including many publicly available services such as climate and air quality regulation, pollination, and the provision of a habitat for biodiversity [22,25–28]. On the other hand, tourists exhibited a higher appreciation for cultural services, which is similar to the high ranking of these services by the farmers in this study. Our results provide more evidence that groups tend to express different interests towards the landscape, depending on how they engage and connect with the local landscape in their daily life [29,30]. Interestingly, in our study, interviewed farmers less frequently identified provisioning services than the cultural ones and very few farmers referred to regulating services. This might be related to the fact that they first reflected on their societal responsibility as farmers before thinking about their own farming and production system through which they make their living. Additionally, tourism is an important income factor in several of the case study regions, including for farmers who live there, and relies on an attractive landscape.

Apart from the differences identified in the stakeholder group, other research found that respondents' perception of ecosystem services was influenced by their age, place of childhood and current residence (urban vs. rural), cultural background, and formal education level (see also [25,31,32]). While urban residents and those holding a higher education degree tended to prefer cultural services over other services, rural residents and those with a lower education degree typically valued the provisioning of food from agriculture, fodder for livestock and timber, or regulating services such as soil erosion control or protection against natural hazards. In light of current urbanization processes taking place in Europe and in other parts of the world [33], it can be therefore hypothesized that the demand for cultural services is likely to increase in the near future, and that the local production of agricultural foods and forage might lose its former significance for large parts of the general public.

The greatest potential for current and future conflicts exists with regard to the increasing intensification in agriculture, where the economic benefits of intensified use collide with the local residents' and tourists' demand for regulating and cultural services, and, increasingly, for healthy food grown without pesticides. Society more frequently protests against the negative health and environmental implications of intensive fertilizer use in agriculture or the application of pesticides in permanent crop cultivation [34–37]. In contrast to intensively used agrarian environments, agricultural land uses, such as extensively used meadows and pastures, and agroforestry systems are perceived as capable of providing multiple provisioning, regulating, and cultural services and thus generate fewer conflicts.

4.2. Good Pastures, Good Meadows, and Biodiversity Management

Farmers in our study considered high diversity of species and good grass composition that supports good fodder quality and good yields as the most defining criteria of good grasslands. Good grass composition and having less mice were more important criteria for meadows than for pastures. Access to watering points and the soil's resistance to trampling were characteristics deemed more important for pastures. In general, high plant productivity can only be achieved through the use of fertilizers but is associated with declining biodiversity [9–12,38,39]. One important driver of increases in productivity is a change in the composition of plant species within the plots. In nitrogen-rich grasslands, high-yielding, nitrogen-loving, and tall plants are becoming mostly dominant. Most farmers were not interested in reducing or completely ceasing fertilization practices (as by local residents and tourists often desired), which support lower-yielding grasses and herbs in such areas. Management for increased and improved species composition and improved fodder quality, although generally lower yielding, is an option for some farmers if they can profit from this type of production with higher prices for their products or receive support payments. Good examples are different Protected Denomination of Origin (PDO) cheeses such as the Comté and Abondance cheeses in France [40,41], Allgäuer mountain cheese (Allgäuer Bergkäse) in Germany, Tiroler Bergkäse in Austria, Appenzeller and Gruyère in Switzerland, and "hay milk" products in Germany and France. However, since the conversion from highly fertilized and productive, less species-rich grasslands to relatively species-rich grasslands takes a minimum of 10–15 years [42], the continuation of extensively managed species-rich grassland is important from a biodiversity point of view.

Regarding biodiversity management of grassland for increased species diversity, one fifth of the interviewed farmers stated that their current practices are, in their opinion, well adapted for good biodiversity management. On some of the farmers' grasslands, this statement was supported by results from surveys of plant and animal species richness, which often confirmed that these famers implemented measures to enhance species richness [43]. Many others mentioned moving towards extensive management during the last decade, although one quarter of farmers stated no change in practices. On the other hand, only a few farmers had changed their practices and management in the opposite direction, towards intensification. This finding contrasts overall trends in Europe [44]. Since the 1950s, agriculture in the European Union has focused mainly on increasing productivity by promoting technical innovations, breeds in livestock, and cultivar crops and by rationalization of agricultural production. This has significantly increased agricultural outputs in Europe. On the other hand, this Europe-wide trend has resulted in an increasing pressure on biodiversity [45,46]. Currently, the majority of agricultural land in the European Union Member States is managed intensively to very intensively [47]. Of course, there are also more low-input farmers, but they account for a small minority of the total area. The statements of our surveyed farmers, therefore, do not agree with the general trends. This difference might be explained by our study sites, which were mountain areas where productivity potentials, especially on steep land or grassland situated at a high elevation, are lower, and where extensive management is still traditional. In the German study area, for example, the grassland in the valleys was quite intensive (high grazing density, lots of slurry), whereas the grassland on steep hills was generally much more extensive. Generally, the surveyed farmers were well aware of existing management options for increasing species diversity on their land. Some farmers stated extensification with less fertilization or a decreased stocking rate and changing cutting regimes (late and less frequent). These management options for increasing species diversity have also been confirmed by different studies [48–50].

4.3. Policies and Measures for Mountain Farmers for Biodiversity Management

In general, the interview results demonstrate that many farmers were well aware of questions around biodiversity management and reveal how farmers thought they could or were already contributing to biodiversity conservation. However, the crucial question remains as to how different policies or measures support farmers for such management. As clearly stated, many are willing to contribute actively, but they are not willing to carry the economic burden exclusively themselves, as they see many challenges for the future of mountain farming and their own existence [23].

If we look at the Common Agricultural Policy (CAP) until now, there were no real incentives in pillar one for biodiversity-friendly grassland management, even with the introduction of additional requirements through the Greening payments. The requirement to keep 5% of the ecological focus areas on the arable land of their farm rarely posed a problem to mountainous farmers, as they were often exempt from this rule due to the dominance of grasslands on their farms, and also were otherwise normally far above the required share due to many pre-existing landscape elements. Additionally, the obligation to maintain permanent grasslands did not constrain mountain farmers, as their production system mainly relied on permanent grassland. Thus, these two obligations to receive subsidies were just status quo measures for farmers in such regions. Moreover, these requirements did not address the potential risks of land abandonment (which exist for certain grassland parcels) and grassland management intensification.

In contrast, the second pillar of the CAP (rural development) offered many different measures to remunerate different types of biodiversity management. Typical agri-environment measures include action-oriented measures such as less frequent cutting, late cutting, cutting regimes for ground-nesting bird conservation, decreased fertilization, planting of hegderows, and maintenance of other semi-natural landscape elements [50–55]. Both the first pillar and the second pillar of the CAP are currently under negotiation and new eco-schemes will be introduced in the first pillar, replacing in parts the greening payments, which will be finished.

In more recent years, different result-oriented measures were proposed to farmers and implemented in different countries in Europe, most of which are applicable in mountainous areas. These measures often require a certain number of species from a pre-defined list of species to be present. For example, for species-rich grassland measures in Germany, four to eight plant species are required out of a catalogue of 20 to 40 species, determined by the Federal States according to regional conditions where such measures are applied [56–60]. In France, the Flowering Meadows measure requires four to six plant species out of a list of indicator plants specific to regional or local conditions [61,62], and for extensive and low-intensive meadows in Switzerland, six species out of >30 are needed, with species lists differentiated between the North and South Alps [63]. Further, on extensive pastures in Switzerland, six species from one of three different lists of 45–60 species are required to receive payments, specified according to the geographical area and elevation. Moreover, payments can be received for achieving a pre-determined level of structural richness: for example, an area must contain at least 5% structural elements (e.g., hedgerows, ponds, stone heaps) on extensive pastures and at least 10% on forest pastures. A final example applies to species-rich limestone grasslands and associated grazed habitats in Ireland [64]. This measure is based on achievement of specific qualitative environmental goals such as habitat condition, richness of biodiversity, soil health, and water-quality. Conservation status is scored on a scale of 0 to 10, with higher scores attracting higher payments.

Besides economic aspects, a farmer's knowledge about biodiversity and ecosystem functioning and the assessment of the farmer's effort to consumers and society are crucial points to foster the implementation of biodiversity-related measures. For example, in a Swiss study it was found that agricultural extension leads to greater proportions of biodiversity priority areas of higher quality [65]. Furthermore, flowering meadow competitions (e.g., in South Tyrol, Italy, and France) and agrotourism initiatives (e.g., biodiversity labels, direct sale) can boost the communication of farmers' biodiversity achievements. A way to promote knowledge and visibility is the introduction of the abovementioned result-oriented measures [66]. Such measures increase public awareness about biodiversity, the self-responsibility for farmers, and site-specific and traditional farming. Additionally, farmers have more flexibility to adapt the measures to their site-specific socio-economic conditions. Finally, these measures are more widely accepted by the public, as the output is directly linked to financial benefits.

5. Conclusions

Habitat and species diversity is decreasing in many countries and areas in Europe. To establish adapted biodiversity management practices or specific measures and new policies for mountainous grasslands, it is crucial to have better insight into farmers' knowledge and perceptions about grassland functions and services, their criteria for good pastures and meadows, which management practices they could envisage using to potentially improve biodiversity management on their grasslands, and which factors would hinder and facilitate their implementation.

The interviews carried out with farmers showed that they have a broad awareness of the services grasslands provide, both for farming systems and for society. Many farmers stated that the grasslands have important functions and services for the landscape. They primarily identified cultural ecosystem services, secondarily mentioning provisioning services and the functioning of their farms, while fewer farmers noted regulating and supporting services.

Farmers mentioned many different criteria that characterize a good pasture or meadow. In order of the most often mentioned attributes, the first related to composition, the second were characteristics of grassland quality and productivity, and third were structural criteria as well as soils and topography.

Farmers reported that they were generally open to modifying their practices to increase services provided by grasslands. The practices that they were ready to implement relate both to the management of the parcels' edges (e.g., planting new trees) and to management of the grassland itself (e.g., late cutting, reduced fertilizer use).

Of the factors that facilitate and inhibit farmers' ability to use improved biodiversity management practices, the most mentioned was increased workload, or more generally not having sufficient time. The lack of financial means to cover additional costs for applying certain biodiversity management practices and the need to obtain financial support for such actions were also important factors. Ambitious policy measures are therefore necessary to support farmers in changing their farming practices. Policies should cover financial support for farmers but they should also foster the exchange of expertise between farmers, flora and fauna experts, and other relevant stakeholders. Interviewed farmers showed interest in learning more about the biodiversity in their pastures. Local initiatives that bring together farmers and flora or fauna specialists to exchange knowledge, for example, about pasture composition and plant characteristics, should also be designed and tested as participatory pilot schemes to improve biodiversity management.

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