

Pastoralism in Europe: characteristics and challenges of highland–lowland transhumance

K. Liechti ^{(1)*} & J.-P. Biber ⁽²⁾

(1) Centre for Development and Environment (CDE), University of Bern, Hallerstrasse 10, 3012 Bern, Switzerland

(2) Bureau Natcons, Steinengraben 2, 4051 Basel, Switzerland, and World Initiative for Sustainable Pastoralism (WISP)

*Corresponding author: karina.liechti@cde.unibe.ch

Summary

Transhumant pastoralism remains a prevalent form of land use across Europe, especially in mountain areas. Besides generating food and other products, it provides a range of public goods and services that are often highly valued by broader society. But transhumance faces structural challenges associated with life in remote mountain areas, including economic pressures, lack of services, low prestige, and ageing populations. These threaten its future. The decline of transhumant systems leads to ecological, economic, and socio-cultural losses, e.g. the loss of biodiversity, of shared cultural heritage based on pastoral practices, and of common property institutions. There are a number of activities that will help to ensure the future of European transhumance, including: *i*) raising awareness of the public services it provides, *ii*) better integrating pastoral issues into national agricultural policies, and *iii*) increasing support for so-called high nature value (HNV) farmlands, which often feature extensive grazing.

Keywords

Cultural heritage – Europe – Extensive grazing – High nature value (HNV) farmland – Highland–lowland – Mountain pasture – Pastoralism – Transhumance.

A brief introduction to pastoralism in Europe

According to the World Initiative for Sustainable Pastoralism (WISP), pastoralism refers to any livestock-based production system that is extensive in nature and features herd mobility (1). Two forms of mobile pastoralism are generally distinguished: nomadic and transhumant. The latter is prevalent across Europe and remains very important from both socio-economic and ecological perspectives. The earliest evidence we have of the domestication of sheep dates back 9,000 years, in an area stretching from the Dead Sea to Iraq, Iran, Syria, and Palestine (2). The first signs of animal farming in Europe emerged in Greece at the start of the Neolithic period (3). Roman historians described abundant drove roads and the importance of transhumance in metropolitan areas corresponding to parts of modern-day Spain (4). Today, transhumant pastoral systems can be found all over Europe, from northern Arctic climates to the Mediterranean south (5)

Transhumant pastoralism in Europe is typically found in mountainous ecosystems (6). In these highland–lowland

systems, herds are moved according to seasonal cycles between fixed points at different altitudes, taking advantage of grazing areas available at different times of the year. Herds are normally taken out for long periods and over great distances, such that returning to the home farm is impossible during certain cycles; at these times, herders live near their herd in a hut or a secondary farm, or regularly travel between their distant farm and these pasturelands to watch over their animals (7). Such highland–lowland (or vertical) transhumant systems are the focus of the present article.

In the following text, the authors outline the characteristics and challenges of transhumance in Europe. Further, they provide insight into the institutional settings of transhumant pastoralism in Europe: namely, the agricultural policies of the European Union (EU) and Switzerland (an example of a non-EU country). To enable better understanding of the themes and issues raised, they provide details of transhumant systems in six different countries: Switzerland, Romania, Norway, Ireland, Spain, and France. Rather than delving too deeply into the diverse systems in every country, they have chosen to focus on some specificities of each that may be of interest to a broader audience. Finally, they offer some thoughts on the future of transhumance in Europe.

Characteristics and challenges of European transhumant highland–lowland systems

Characteristics

In Europe, more than four million hectares (ha) of agricultural land rely on transhumance (8). Important factors differentiating pastoral areas from other agricultural or natural areas include their collective-management dimension (9) and the key institutional interlinkages they foster between highlands and lowlands. Whereas lowland pastures and meadows are often privately owned, highland or mountain pastures are frequently held and managed in common by smaller or larger governance bodies (see e.g. 10). Other characteristic features of European transhumance include: physical structures such as drove roads, mountain dwellings, barns, and fencing; specialised cheese and meat products; cultural values and practices, such as seasonal festivities, linked to livestock mobility; and local institutions of governance related to pasture access, communal works, or product distribution.

Besides generating food and other products, transhumance in Europe provides a range of public goods and services that are often highly valued by broader society. These include preservation of picturesque cultural landscapes that support tourism; protection of biodiversity; carbon sequestration; fire resilience (e.g. prevention of shrub invasion, or drove roads serving as fire breaks); and a range of social goods, such as cultural diversity and people's sense of regional identity (6, 11, 12). Vertical transhumance is seen as particularly important for the protection and maintenance of mountainous areas, which have been described as 'Europe's ecological backbone' (13; cit. in 6). Furthermore, transhumant highland–lowland systems contribute significantly to the maintenance of so-called 'high nature value (HNV) farmlands'. HNV farmland is defined as land which is primarily used for agriculture and which supports, or is associated with, high levels of species and habitat diversity and/or the presence of species of European conservation concern (14, 15, 16, 17).

Consequently, transhumant systems are currently the subject of a '[...] requalification of the functions of pastoral activity, envisaged more and more as a supplier of environmental or ecosystem services and/or externalities and/or [other] public goods' (9). In Languedoc in the south of France, for example, there is rising demand for the environmental, social and cultural services provided by the pastoral rangelands in the Cévennes mountains and on the limestone plateaux known as 'the Causses'. Together, these two areas have been declared a UNESCO World

Heritage Site and are collectively known as 'The Causses and the Cévennes, Mediterranean agro-pastoral Cultural Landscape'. According to the assessors, 'the Causses and the Cévennes manifest an outstanding example of one type of Mediterranean agro-pastoralism' (18, 19).

Challenges

European mountain area transhumance faces several challenges. Above all, it confronts structural obstacles and economic constraints stemming from wider trends of agricultural intensification and from life in remote mountain areas. Underinvestment has led to declining infrastructure (e.g. processing facilities, shops) and services (e.g. veterinary and agricultural extension) in these areas (7). Transhumant households often have difficulty earning enough income and staying competitive due to the long distances to markets and the harsh conditions of the natural environment. In combination with a lack of vocational training and the often low prestige of pastoral work, these sorts of economic constraints are causing outmigration, leaving pastoral areas with an ageing population. Ultimately, this leads to a reduction in pastoralism or the abandonment of pastoral activities altogether (see e.g. 20, 21, 22, cit. in 23). On the Causse de Blandas (20,000 ha) in southern France, for example, a 1954 survey found that the number of small herds had drastically declined, from over a hundred in the early 20th Century to only 29 that year. By the late 1970s, many older livestock keepers had retired and very few young people remained to take over – most had moved to cities (24). In 2013, the last remaining goat herd of the Causse disappeared, and by 2015 there were only three herds of sheep left. Today, two herds of Aubrac cattle roam the pastureland of the Causse (personal observation).

Another key challenge for traditional European transhumance is agricultural intensification in lowland areas, which is often accompanied by increasing farm sizes, a shift to external inputs (e.g. soy protein concentrates as fodder), and the use of high-yielding livestock breeds unsuited to mobile pastoralism (see e.g. 25). These factors are also leading to the alteration and/or abandonment of transhumant systems and with it the underuse or abandonment of mountain pastures. Shrub invasions, reforestation (26, 27, 28, 29, 30, 31), loss of biodiversity (5), and increasing risks of natural hazards, such as bush or forest fires (32), are often the result.

In addition, transhumant systems must deal with tensions arising between the growing number of increasingly diverse actors with claims on pastoral commons (33). Sources of tension include, for instance, conflicting views on the need to protect or eliminate predatory animals (34, 35) and rising demand for recreational use of mountain areas. Decreasing knowledge in the general population about the conditions needed to maintain the special character of

transhumant cultural landscapes (see e.g. 36) can lead to misunderstanding or even conflict between pastoralists and other land users. Diverging claims can also directly curb livestock mobility: many pastoral drove roads have been broken up or transformed into roads, private arable land, or forest after a few years of disuse (see e.g. 4, 37, 38). Further, drove roads are seen as corridors for zoonotic diseases such as brucellosis, which are an obstacle to transhumance (see e.g. 39).

Where transhumant activities decline in number, we frequently witness a corresponding loss of traditional local institutions and/or practices, such as common property regimes (e.g. communal works or grazing cooperatives) (see e.g. 40). Maintaining systems of common property use and management requires a certain number of participants: if allowed to dip below a particular quantity, the system can cease to function properly. Such loss of critical mass can also affect the representation of pastoralists in important public bodies, harming their involvement in important decision-making (Liechti *et al.*, 2016, unpublished).

Policies affecting transhumance

European Union Agricultural Policy

The Common Agricultural Policy (CAP) of the EU constitutes a large part of the overall EU budget: 42% in 2011 (6). CAP supports farmers by providing financial aid through a range of mechanisms, including price guarantees and direct payments. Because it is arranged on a pan-European basis, national governments can no longer provide separate direct support to their agricultural sectors. They must use and administer the funds allocated to them via CAP (41). In contrast to policies in parts of the world where pastoralism – especially mobile pastoralism – is presently undervalued or even discouraged, current EU policy officially endorses low-intensity transhumant livestock management as a source of environmental, economic, and cultural benefits (42). The EU provides general guidelines, and Member Countries implement them in a variety of different ways, some of which are more favourable to pastoralism than others.

The CAP budget is structured according to two pillars. Pillar 1 covers direct payments to farmers and market subsidies (including export subsidies). Income support in the form of direct payments accounted for 56% of CAP expenditure in 2006, while total Pillar 1 expenditure made up 80.8% of all CAP spending for the 2007–2013 period (43). Pillar 2, for its part, covers a variety of Rural Development Programmes (RDPs) that may be used to support HNV farming – and thus pastoralism and transhumance. The European Agricultural Fund for Rural Development finances the corresponding

agri-environment schemes. Pillar 2 comprises four axes: Axis 1 aims at improving the competitiveness of the EU agricultural (and forestry) sectors. Axis 2 aims at improving the environment and the countryside by focusing on biodiversity, HNV farming, water resources, and climate change. It includes agri-environment schemes such as:

- Less Favoured Areas (LFA) payments, which support farmers operating in challenging environments (e.g. on steep terrain) (44)
- Agri-Environmental Measures (AEMs), which compensate farmers if they voluntarily enter into a five-year commitment to implement practices considered environmentally beneficial (45)
- Natura 2000 compensation payments, which support farming systems to achieve conservation objectives (46).

Member Countries may also design thematic sub-programmes emphasising specific issues such as young farmers, small farms, mountain areas, women in rural areas, climate change mitigation/adaptation, biodiversity, and short supply chains (47).

Transhumance is not specifically mentioned in the CAP reform 2014–2020 (48), but as a provider of ecosystem services it is covered under Pillar 2. It is also related to three key challenges set out in CAP 2014–2020: environment and climate change, maintenance of viable rural areas, and food security (49). Systems of transhumance can especially benefit from LFA payments, since much of the land used for transhumance is LFA land, which includes mountains (50). In Romania for instance, where animals graze on mountain grasslands for approximately half the year, livestock farmers benefit from HNV grassland support measures (50). The French government's *Programme de développement rural hexagonal* 2007–2013 includes special compensation for transhumance of small ruminants such as sheep and goats (51). In Ireland, livestock farmers (including those in transhumance areas) receive LFA payments if they abide by certain conditions (e.g. limits on stocking densities) for at least five years (52).

Nevertheless, despite official EU/CAP policy support for pastoralism and transhumance, the reality is that much of the EU funding flows to intensive agriculture – not to low-intensity livestock keeping (53). Further, although CAP has become more environmentally oriented with each revision and reform since 2003, its impact on the distribution and quality of extensive grasslands has come in for harsh criticism. Observers point to poor integration of frameworks that favour extensive land use by livestock keepers, insufficient support measures, and obstacles to implementation (54). According to Beaufoy and Marsden (55) and several European conservation NGOs, the current EU CAP system has failed '[...] to meet environmental aims

that are intimately tied up with farming and the use of rural land, such as the target to halt biodiversity decline by 2010'. One key way of achieving this target would be to support agricultural systems – such as pastoralism – that maintain HNV farmlands (55).

Swiss Agricultural Policy

Preservation of food security, efficient and sustainable use of natural resources, maintenance of cultural landscapes, and support of LFAs are the stated objectives of the Swiss Agricultural Policy 2014–2017 (see e.g. 56, 57). Direct payments are its key support mechanism, enabling a division between price policy and income policy. The aim of direct payments is to ensure that agricultural land is used and cared for appropriately and that farmers are compensated for the public goods they provide. A distinction can be made between general and ecological direct payments. Additional payments are made to farmers working in hilly and mountainous areas where steep terrain complicates cultivation and animal keeping (58, 59).

As for transhumance, special payments for grazing livestock on mountain pastures in the summer (about 4% of all direct payments) are regulated in the *Sömmerungsbeitragsverordnung* ('ordinance on summer pasturing payments'), or *SöBV* (see 60). It is intended to fulfil the State's duty of conserving cultural landscapes, biodiversity, and sustainable resource use (61, 62). The *SöBV* requires each Swiss canton (State subdivision) to define the maximum sustainable yield – i.e. number of livestock – for each area of summer pasture on the basis of its productivity. Alpine farmers must keep their summer pasture use within 75–110% of the maximum sustainable yield to remain eligible for full direct payments (*SöBV*, Art. 11). The *SöBV* also sets out sustainability rules on protecting pastures from shrub and forest invasions, locally adapted fertilisation practices for biodiversity, weed control, maintenance of alpine infrastructure, and more (60, 62). However, implementation and monitoring of these sustainability criteria is difficult, or is subject to a wide margin of interpretation, as has been shown, for example, regarding natural regrowth or erosion (63; cit. in 62).

Research has shown that summer grazing payments contribute decisively to transhumance and to the corresponding management and maintenance of mountain pastures (61, 64). Model calculations estimate that they contribute, on average, about 83% of the total income of each individually or collectively owned *Sömmerungsbetrieb* ('summer grazing enterprise') during the summer months (65; cit. in 61). Nevertheless, the payments have not been enough to halt the decline of summer grazing in mountain pastures (see 64).

Exemplary cases

Switzerland

Transhumance has a long, important tradition in Switzerland, characterised by movement between winter livestock-keeping in valleys, summer grazing on high-altitude mountain pastures, and spring/autumn grazing on mid-altitude pastures. The expansion of arable land to include high mountain areas began somewhere between the 9th and 13th centuries (66), and the oldest recorded mention of mountain pasture-use regulations dates back to 1160 in the *Acta Murensia* (67). Some of the regulations still in force today have their origins in texts drawn up hundreds of years ago: the basic regulations of the Grindelwald Alpine cooperatives, for instance, were drafted in 1414, resulting from the growing independence of local farmers and a sustainability crisis (68). These directives, albeit with a few changes (see 10, 69), continue to regulate the use of common property summer pastures, including access rights and the relationship between lowland land tenure and the number of livestock allowed to graze in mountain areas (Liechti *et al.*, 2016, unpublished; 70).

Today, one-third of Switzerland's total agricultural area – 11% of the country itself – consists of mountain pastures, or *Sömmerungsgebiet* ('summer grazing area'), stocked via transhumance in summer months (71, 72). Nearly half (48%) of all Swiss livestock farms use summer grazing areas, and there are about 7,090 *Sömmerungsbetriebe*, which together employ a total of approximately 17,000 workers (61, 71). About 100,000 dairy cows are brought to summer grazing areas as well as suckler cows, young cattle and calves, sheep, horses, goats, llamas, and other ruminants (73) (Fig. 1). Notably, 76% of Switzerland's protected and highly biodiverse dry meadows and pastures are located in summer grazing areas (71).



Fig. 1
On the way to the summer grazing area: a Swiss Alpine farmer herds his dairy cows
(Photo: Gery Ryter, 2014)

Swiss mountain pastures are either owned by single households or by collectives (71). In many regions, collective management systems still function widely. They feature practices such as *Gemeinwerk* ('collective maintenance work'), in which tasks such as clearing shrubs from mountain pastures are shared. In such systems, the number of work hours required of each individual typically corresponds to the number of livestock he or she grazes in summer (10, 74). In some regions, however, declining numbers of farms and labourers are impeding collective pasture work (Liechti *et al.*, 2016, unpublished; 74)

Mountain farming remains widely appreciated in Swiss society, and transhumance in particular (an idealised version, at least) shapes national identity and many Swiss people's sense of place (75). There are even trends of non-Alpine residents, including young city dwellers, spending one or more summers in the summer grazing areas to care for livestock and to help produce dairy products such as cheese (76, 77). Further, public support for transhumance reflects its importance to the tourism sector, since Swiss pastoralism helps shape and maintain picturesque Alpine landscapes that attract tourists.

Yet Swiss transhumance faces challenges. These include:

- difficulty adapting to structural changes in the agricultural sector related to market liberalisation and more competition (see e.g. 78)
- declining numbers of livestock
- increasing use of high-yielding livestock breeds unsuited to transhumance
- disuse of remote pastures, which enables shrub invasions and reforestation (see e.g. 26, 78, 79, 80) and leads to intensified use of remaining areas (81) and loss of biological diversity (81, 82).

Finally, large predators affecting transhumance – such as bears, wolves, and lynx – are a controversial issue in Switzerland, although there is an apparent mismatch between the intensity of debate and the actual economic impact of these predators (75).

Romania

The first recorded evidence of pastoralism in the Romanian Carpathians – deeds for hay meadows and pastures – dates back to the 13th Century (83; cit. in 38). Common property pastures have been a characteristic of the area ever since, albeit within a variety of different institutional settings over the years (see e.g. 40, 84). During the Communist period (1947–1989), 90% of agricultural areas were run by collective or state farms (21). Nevertheless, over 2,850 mountain villages (about 10% of all agricultural land) avoided communist collectivisation due to their remote

location, frequently dispersed settlement patterns, and/or relatively unproductive land (21, 38). The formal end of Communism in 1989 increased many rural communities' reliance on subsistence or semi-subsistence farming (21).

The persistence of smallholder production in Romania – it has the highest number of smallholdings per capita in the EU (40) – especially in its mountain and upland regions, has greatly benefited local biodiversity (21). Romania has a high level of HNV farmland by European standards (21). Further, in areas such as the Eastern Carpathians, local people display an incredibly rich ecological knowledge of species and habitats and are skilled in maintaining hay meadows (e.g. scattering hay seeds, weeding) and pastures, all of which contribute to local species diversity (85). Nevertheless, the persistence of traditional land use practices that preserve HNV landscapes is largely seen as the result of poverty and a lack of other opportunities in rural areas, not as the product of people's active desire to maintain traditional landscapes (84). Today, local biodiversity is increasingly jeopardised by intensification and land abandonment (21). Further, ageing of the smallholder population threatens the survival of those land-use practices most strongly associated with HNV landscapes (21).

Transhumance and seasonal common property grazing continue to play an important role in Romania. Over half of permanent pastureland is common grazing land that is subject to multiple grazing rights (40). However, the combined effects of Romania's accession to the EU, market liberalisation, and the corresponding introduction of CAP instruments are rapidly changing the context of common land use (40). According to Sutcliffe *et al.* (40), 'in many cases the formation of new commons institutions is occurring on top of fragments of older ones, but with the added challenges of widespread post-Socialist mistrust in collective action and an uncertain future for agriculture in the country'. The current system is causing a growing 'quasi-privatisation': common pastures are being divided up and rented by wealthier individuals who are mainly interested in receiving subsidies, possibly weakening traditional collective management of large land areas (40) and harming the environment (86; cit. in 40).

Norway

Two distinct systems of transhumance exist in Norway today: i) herding of sheep, goats and cattle to mountain areas for summer grazing; and ii) the Sami reindeer husbandry system. Besides contributing to food security, both systems are also crucial to cultural and landscape diversity (see e.g. 87, 88). This is reflected in Norway's current agricultural and environmental policies (e.g. 89). Since the mid-1980s, Norwegian agricultural policy has expanded to include non-food concerns related to ecological and cultural issues, with agricultural payments increasingly allocated on the

basis of the production of public goods and not just food (90). Transhumance is supported by the new Norwegian Agriculture and Food Policy, introduced in November 2011 by the Ministry of Agriculture and Food (Report to the Storting, no. 9, 2011–2012). One of the four main objectives is the preservation of agriculture in all parts of Norway (91). Measures that support the use of summer grazing areas include special transhumance payments and funding for the restoration of summer farm buildings (92).

Summer transhumance of sheep, goats, and cattle is reflected in the ancient Norse sagas, going as far back as 1200 BP (93). Scientific evidence places it in the Iron or even the Bronze Age (94). Still prevalent throughout Norway, summer transhumance comprises a wide range of agricultural practices, depending on the local natural conditions (95). The golden period of summer transhumance was the 19th Century, when over 70,000 summer farms existed across Norway (96; cit. in 95). In the 20th Century, dramatic changes in agriculture also impacted Norway's summer farms. According to Austad *et al.* (95; based on 97 [in Norwegian]), 'more use of cultivated grasslands in the lowlands and high consumption of feed concentrates for the domestic animals reduced the importance of the outfield resources and many summer farms fell into disuse'.

Today, about 1,300 summer farms remain in Norway (87). While dairy production in the summer grazing areas was prevalent through the mid-20th Century, it has declined to the point where sheep and cattle grazing for meat production are now all that remain in many areas (see e.g. 98). Full or partial abandonment of summer farms has caused large-scale regrowth of trees and shrubs, extensive landscape changes, and reduced biodiversity in mountain areas (see e.g. 87, 95, 99). Nevertheless, according to Daugstad *et al.* (100): 'when discussing the role of agriculture as an upholder of cultural values, Norwegian actors as well as those within a Nordic context, provide a strong emphasis on farmers as the main defenders of cultural heritage linked to agriculture or rural communities'.

Reindeer husbandry is intertwined with the Sami populations and culture prevalent in Norway, Sweden, Finland, and Russia. In Norway, reindeer husbandry is just a small part of the agriculture industry, but among the Sami and in the local context, it has considerable importance economically and culturally (89). Reindeer operations are found in nearly 140 of Norway's municipalities, and the net area available for grazing is approximately 90,000 km², or nearly 30% of Norway's land area (89). In the reindeer transhumant system of the Sami, reindeer are seasonally moved between pastures. In Finnmark, for example, Europe's northernmost region, reindeer spend most of the year on common pastures inland, but in the summer they are moved to individually held pastures on the coast (101).

A north–south distinction may be made regarding the sustainability of resource use in reindeer husbandry. Though virtually all reindeer herders in Norway were subject to the same external changes – e.g. new technologies, increased market access, and new state policies (e.g. slaughter subsidies) – only pastures in northern Norway have been overgrazed in recent decades (101, 102). Riseth and Vatn (102) suggest several reasons for this: in the north, the obstacles to collective management were greater because of the high number of herders and vast land areas. In the south, by contrast, pressures to sedentarise began earlier and Sami populations were better able to organise and communicate with decision-makers; among other things, this led to agronomic capacity-building in the process of changing management practices. Further, herders in the north saw policy changes as externally driven and not suited to their situation, whereas the Sami in the south were able to participate in and shape institutional changes.

Ireland

As in most European countries, pastoralism in Ireland dates back to the Neolithic. Agricultural land accounts for over 60% of Ireland's land area, and over 90% of this agricultural land is grassland. More than 121,800 holdings have livestock, two-thirds of which are bovines and one-third sheep (103). The majority of Ireland's HNV farmland is pastureland. Its pastoral system is mainly characterised by year-round grazing without 'meadowing' (hay-making), which partly reflects certain social realities in Ireland: the farming population is ageing, and farming is increasingly a part-time activity that is less labour intensive than in the past (104).

A unique feature of Irish pastoralism is the 'reverse transhumance' practised in the Burren, an area of limestone hills (formerly woodland) on the country's west coast (105). Here, cattle are kept in the lowlands in summer – the opposite of elsewhere in Europe – because higher elevations are too dry at this time. In winter, however, the limestone keeps the higher parts warm and rich in grass, enabling them to be used as winter grazing areas (106) (Fig. 2). This tradition of winter grazing, or 'winterage', protects the Burren's flowers (dormant in winter) and insects, which then flourish unhindered in summer.

Spain

Agricultural areas in Spain comprise about half of its territory, with pastures and meadows covering around 28% of all agricultural land (107). Another 25% of agricultural land is deemed fallow or out of use. However, this fallow land may well be used as pastureland, at least in part. Since high elevations, poor soils, and extreme climatic conditions hinder intensive farming throughout much of Spain, many areas are under low-intensity farming. Most such areas



Fig. 2
Cattle grazing in the winter in Ireland's Burren landscape
 (Photo: Brendan Dunford, 2015)

are considered HNV farmland (107), harbouring highly diverse plants and animals. Mountain pastures are typically common property, much of it unfenced (107).

Spanning routes of several hundred kilometres, long-distance transhumance between lowlands and mountain areas was prevalent in Spain up through the mid-20th Century. Today, some 125,000 km of drove roads still exist and are protected by law. Called *cañadas* or *vías pecurias* in Spanish, many of them continue to be used by Spain's approximately 90,000 remaining shepherds. One such drove road runs right through the city of Madrid, and is the site of a well-visited annual festival (Jesús Grazón, personal communication). Taken together, Spain's *cañadas* cover 425,000 ha, or 1% of the country's surface area (108). They range between 500 and 800 km in length (the one extending from Seville to the province of Soria is the longest



Fig. 3
Sheep on their way between Extremadura and Rioja, Spain, along a route sprinkled with green oaks
 (Photo: Jesús Garzón, 2010)

at 800 km), and are usually no wider than 75 m. The main drove roads are oriented from north to south, and they form part of a network that is interconnected by secondary, third-, fourth-, and fifth-level roads. Besides its main function for herding, this network links together different habitats through ecological corridors (4) (Fig. 3).

Many products of Spanish pastoralism have been given special labels of quality, such as Protected Designation of Origin (PDO). For example, the right to carry PDO labels has been awarded to several artisanal cheeses (Cabrales, Leon, Picon de Bejes-Tresviso, Valdeón, Liébana, Gamonedo or Beyos cheeses) produced in traditional pastoralist buildings in the Picos de Europa, a UNESCO Biosphere Reserve and National Park in the high mountains of the Gran Cantabrica on northern Spain's Atlantic coast (109). The region consists mainly of grasslands used by transhumant sheep, goat, and autochthonous cattle breeds. A collective of pastoralists, the 'Pastores de los Picos de Europa', have issued a public '*Manifiesto des los Pastores*'. It declares their desire to safeguard pastoralist livelihoods, conserve pastoral culture, and conserve mountain areas and the Picos de Europa National Park (110).

France

Pastoralism in the Causses and the Cévennes goes back to the beginning of the Neolithic, to about 6000 BP (111). Contemporary humans were mainly hunters and gatherers, but had already domesticated goats and sheep. When Europe's climate became much warmer and drier some 4,000 years ago, hunting declined and livestock breeding grew in importance. Transhumance from the lowlands of Languedoc to the uplands of the Causses and the upper Cévennes eventually became a necessity due to the lack of food in the plains during the dry summer months (111). Nowadays, pastoralism still exists across much of France. Transhumance is practised in the mountainous regions of the Pyrenees; between the plains of Languedoc-Roussillon and the Causses (Fig. 4), the Cévennes, and Lozère; between the Crau and the Alps; in the Jura Mountains; and in the Vosges (112).

Pastoral land constitutes much of France's HNV farmland (113). It is frequently privately owned in the lowlands. However, most of France's summer grazing pastures in the Alps belong to the communes, with the rest held by the state or privately (114). In Languedoc, many of the highland summer pastures are privately owned (115), but the transhumance routes that run alongside them – called *drailles* – have a special ownership status: most of the *drailles* are seen as belonging to the owners of the abutting land, but herders may use them for free, based on historical easement, or 'right of way' rules (37). This policy has sometimes caused friction: landowners whose land neighbours the *drailles* have occasionally tried to annex them



Fig. 4
Aubrac cattle grazing in a pasture, Causse de Blandas,
Languedoc, France
 (Photo: J.-P. Biber, 2015)

for their own exclusive use. In other cases, the *drailles* have been afforested by France's forestry department following a few years of disuse (37). The *drailles* that remain in use are maintained either by associations of livestock keepers or by individual livestock keepers. In many regions, however, the *drailles* are no longer used for long-distance transhumance, as large transport vehicles are employed instead.

Transhumance in France is not limited to transhumance *within* the country; for French herders and their counterparts in neighbouring countries, transboundary transhumance is a regular part of their seasonal herding. Such cross-border movement occurs between France and Italy, from the Crau near the delta of the Rhone river to the Alpine valleys of the Piemonte (116), as well as between France and Spain through the Pyrenees. INTERREG, an EU programme to enhance regional development, has supported several projects that have examined ways of improving and supporting cross-border transhumance (117).

Wolves are a current challenge to herders in France. Up until the 1930s, wolves were simply a part of life for herders in France and elsewhere, but the species disappeared in the French Alps for about six decades. The reappearance of wolves in the 1990s caused a crisis in France, as it did in other European countries (118). Herders must now reintroduce extensive management systems capable of coping with these predators as well as with feral or stray dogs. These include herd protection measures such as the use of shepherds, enclosures, and guard dogs. France has even created shepherding schools over the last decade, and training in how to deal with wolves is part of the curriculum. These schools provide training in pastoralism as a professional vocation, and their main aim is to increase the overall appreciation and standing of pastoralism.

Upon completion of their training, those who attend the schools receive a professional certificate as a transhumant shepherd (119).

Conclusions

Transhumance remains important in Europe, but it faces challenges and is declining in many areas. Its reduction and abandonment cause losses ecologically, aesthetically, economically, culturally, and politically. European transhumance supports the preservation of habitat diversity and HNV farmland, and frequently helps maintain picturesque, open landscapes. It is a significant source of employment and income for those who still practise it. Further, it helps preserve traditional products, local breeds, and regional knowledge and customs, all of which are fundamental to many Europeans' sense of identity and regional belonging. Transhumance is also a meaningful source of civic engagement and community cohesion among pastoralists, who organise collectively to voice their interests in political affairs. Finally, it provides a living example of common property resource management in action.

There are several promising ways of safeguarding the future of European transhumance and the diverse services it provides. Above all, it is necessary to increase official recognition of the public goods provided by transhumant systems (8). This will involve integrating pastoral issues into agricultural policies more effectively and increasing support for HNV farmlands, extensive grazing, and livestock movement. More research on pastoral issues is needed to steer such policies, especially in the fields of economics (e.g. on externalities, public goods, HNV farmlands, returns on public investments) and political science, and we need to develop mechanisms of support for pastoral systems. Safeguarding transhumance also requires raising awareness of pastoral issues, challenges, and contributions among the general public and professionals, for example through information campaigns or through transdisciplinary participatory processes (120). Finally, increasing professional qualifications related to herding (8) and strengthening common property institutions are crucial steps. Transhumant pastoralism is a fundamental part of Europe's heritage and continued quality of life – the costs of losing European transhumance are far greater than those required to sustain it.

Le pastoralisme en Europe : caractéristiques et défis de la transhumance de la montagne vers la plaine

K. Liechti & J.-P. Biber

Résumé

Le pastoralisme transhumant constitue encore aujourd'hui une modalité courante d'utilisation des terres en Europe, particulièrement dans les régions montagneuses. Outre les denrées alimentaires et autres produits directs, le pastoralisme est créateur d'une panoplie de services et de biens publics auxquels la société accorde souvent une grande valeur. Mais la transhumance est également confrontée aux difficultés structurelles inhérentes à la vie dans les régions montagneuses isolées, en particulier la pression économique, la pénurie de services, le manque d'attractivité et le vieillissement de la population. L'avenir du pastoralisme s'en trouve menacé. Le déclin des systèmes de transhumance entraîne des pertes écologiques, économiques et socioculturelles, notamment en termes de biodiversité, de patrimoine culturel commun fondé sur les pratiques pastorales et d'institutions collectives. Quelques mesures pourraient contribuer à préserver l'avenir de la transhumance en Europe: *i)* faire prendre conscience des services que la transhumance rend à la société; *ii)* intégrer davantage les problématiques du pastoralisme dans les politiques agricoles nationales; *iii)* renforcer le soutien accordé aux systèmes agricoles dits à haute valeur naturelle, dont le pâturage extensif fait partie.

Mots-clés

Alpage – Europe – Pastoralisme – Patrimoine culturel – Pâturage extensif – Système agricole à haute valeur naturelle – Transhumance – Transhumance de la montagne vers la plaine.



El pastoreo en Europa: características y problemas de la trashumancia de tierras altas-tierras bajas

K. Liechti & J.-P. Biber

Resumen

El pastoreo trashumante sigue siendo una forma común de utilización de la tierra en toda Europa, especialmente en las zonas montañosas. Además de generar productos alimentarios y de otra índole, la trashumancia aporta una serie de bienes y servicios públicos a los que la sociedad en general suele conceder gran valor. La trashumancia, sin embargo, afronta problemas estructurales ligados a la vida en zonas montañosas aisladas, tales como las presiones económicas, la falta de servicios, el escaso prestigio de esta actividad o el envejecimiento de las poblaciones que la ejercen. Todo ello amenaza su futuro. El declive de los sistemas trashumantes trae consigo pérdidas ecológicas, económicas y socioculturales, por ejemplo el empobrecimiento de la diversidad biológica, el de un patrimonio cultural común basado en los usos pastorales y el de las instituciones de propiedad colectiva. Entre las diversas actividades que ayudarán a asegurar un porvenir a la trashumancia europea, los autores destacan las

siguientes: *i)* sensibilización con respecto a los servicios públicos que presta; *ii)* mayor integración de los asuntos relativos al pastoreo en las políticas agrícolas nacionales; y *iii)* mayor apoyo a las llamadas tierras agrícolas de gran valor natural (*high nature value*: HNV), que a menudo albergan pastizales extensivos.

Palabras clave

Europa – Pastizal extensivo – Pasto de montaña – Pastoreo – Patrimonio cultural – Tierra agrícola de gran valor natural (HNV) – Tierras altas–tierras bajas – Trashumancia.



References

- Hatfield R., Davies J., Wane A., Kerven C., Dutilly-Diane C., Biber J.-P., Merega J.L., Ochieng Odhiambo M., Behnke R. & Gura S. (2006). – Global review of the economics of pastoralism. International Union for Conservation of Nature, Nairobi, 47 pp.
- Duclos J.-C. (2006). – La pratique de la transhumance d'hier à aujourd'hui. In *Aux origines de la transhumance : les Alpes et la vie pastorale d'hier à aujourd'hui* (C. Jourdain-Annequin & J.-C. Duclos, eds). Picard, Paris, 14–23.
- Halstead P. (1996). – Pastoralism or household herding? Problems of scale and specialization in early Greek animal husbandry. *World Archaeology*, **28** (1), 20–42. doi:10.1080/0438243.1996.9980329.
- Manzano B.P. & Casas R. (2010). – Past, present and future of *Trashumancia* in Spain: nomadism in a developed country. *Pastoralism: Res., Pol., Pract.*, **1** (1), 72–90. doi:10.3362/2041-7136.2010.005.
- Oppermann R., Beaufoy G. & Jones G. (eds) (2012). – High Nature Value farming in Europe. Verlag Regionalkultur, Basel, 544 pp.
- Nori S. & Gemini M. (2011). – The Common Agricultural Policy vis-à-vis European pastoralists: principles and practices. *Pastoralism: Res., Pol., Pract.*, **1**, 27. doi:10.1186/2041-7136-1-27.
- European Commission (EC) (2009). – Peak performance: new insights into mountain farming in the European Union. Commission Staff Working Document, 1724 final. Directorate-General for Agriculture and Rural Development, Brussels.
- Herzog F., Bunce R.G.H., Pérez-Soba M., Jongman R.H.G., Gómez Sal A. & Austad I. (2005). – Policy options to support transhumance and biodiversity in European mountains: a report on the TRANSHUMOUNT stakeholder workshop, Landquart/Zurich, Switzerland, 26–28 May 2004. *Mountain Res. Dev.*, **25** (1), 82–84. doi:10.1659/0276-4741(2005)025[0082:pots ta]2.0.co;2.
- Eychenne C. & Lazaro L. (2014). – Summer pastures: between 'commons' and 'public goods'. Representations of pastoral areas and forms of government intervention. *J. Alpine Res.*, **102-2** [on line]. doi:10.4000/rga.2303.
- Baur I. & Binder C.R. (2013). – Adapting to socioeconomic developments by changing rules in the governance of common property pastures in the Swiss Alps. *Ecol. Soc.*, **18** (4), 60. doi:10.5751/ES-05689-180460.
- Cooper T., Hart K. & Baldock D. (2009). – Provision of public goods through agriculture in the European Union. Report prepared for DG Agriculture and Rural Development. Institute for European Environmental Policy, London, 396 pp. Available at: www.ieep.eu/assets/457/final_pg_report.pdf (accessed on 1 August 2015).
- Rodríguez-Ortega T., Oteros-Rozas E., Ripoll-Bosch R., Tichit M., Martín-López B. & Bernués A. (2014). – Applying the ecosystem services framework to pasture-based livestock farming systems in Europe. *Animal*, **8** (8), 1361–1372. doi:10.1017/s1751731114000421.

13. European Environment Agency (EEA) (2010). – EEA Report No. 6/2010. Europe's ecological backbone: recognising the true value of our mountains. Office for Official Publications of the European Union, Luxembourg. Available at: www.eea.europa.eu/publications/europesecological-backbone (accessed on 1 August 2015).
14. Andersen E. (ed.) (2003). – Developing a High Nature Value farming area indicator. Internal report. European Environment Agency, Copenhagen, 76 pp.
15. Halada L., Evans D., Romão C. & Petersen J.-E. (2011). – Which habitats of European importance depend on agricultural practices? *Biodivers. Conserv.*, **20** (11), 2365–2378. doi:10.1007/s10531-011-9989-z.
16. Bignal E.M., McCracken D.I. & Corrie H. (1996). – Defining European low-intensity farming systems: the nature of farming. *Wader Study Group Bull.* **80**, 62–68. [Reprinted from: D.I. McCracken, E.M. Bignal & S.E. Wenlock (eds) (1995). – Farming on the edge: the nature of traditional farmland in Europe. Joint Nature Conservation Committee, Peterborough.]
17. Bunce R.G.H., Pérez-Soba M., Jongman R.H.G., Gómez Sal A., Herzog F. & Austad I. (eds) (2004). – Transhumance and biodiversity in European mountains. Report of the EU-FP5 project TRANSHUMOUNT (EVK2-CT-2002-80017). IALE Publication Series, No. 1, 321 pp. Available at: www.researchgate.net/publication/40125001_Transhumance_and_biodiversity_in_European_mountains (accessed on 1 August 2015).
18. United Nations Educational, Scientific and Cultural Organization (UNESCO) (2015). – The Causses and the Cévennes, Mediterranean agro-pastoral cultural landscape. Available at: <http://whc.unesco.org/en/list/1153> (accessed on 1 August 2015).
19. Ambassadeurs du patrimoine mondial des Causses et Cévennes (2015). – Les Causses & les Cévennes, paysage culturel de l'agro-pastoralisme inscrit sur la Liste du patrimoine mondial. Available at: www.caussesetcevennes.org (accessed on 1 August 2015).
20. Rieutort L. (2006). – Transhumance et gestion des territoires montagnards: l'exemple des hautes terres lozériennes. In *Transhumance et estivage en Occident – des origines aux enjeux actuels* (P.-Y. Laffont, ed.). Presses universitaires du Mirail, Toulouse, 367–384.
21. Page N., Bălan A., Huband S., Popa R., Rákossy L. & Sutcliffe L. (2012). – Romania. In *High Nature Value farming in Europe* (R. Oppermann, G. Beaufoy & G. Jones, eds). Verlag Regionalkultur, Basel, 346–357.
22. Susmel P., Fabro C. & Filacorda S. (2004). – Transhumance in the Italian Alps and Appenines. *Transhumance and biodiversity in European mountains*. IALE/Alterra, Wageningen, the Netherlands.
23. Pardini A. & Nori M. (2011). – Agro-silvo-pastoral systems in Italy: integration and diversification. *Pastoralism: Res., Pol., Pract.*, **1**, 26. doi:10.1186/2041-7136-1-26.
24. Durand-Tullou A. (2003). – Un milieu de civilisation traditionnelle. Le Causse de Blandas. Edition du Beffroi, Millau, France, 518 pp.
25. Eriksson C. (2011). – What is traditional pastoral farming? The politics of heritage and 'real values' in Swedish summer farms (*fåbodbruk*). *Pastoralism: Res., Pol., Pract.*, **1**, 25. doi:10.1186/2041-7136-1-25.
26. Baur P., Bebi P., Gellrich M. & Rutherford G. (2006). – WaSAlp – Waldausdehnung im Schweizer Alpenraum. Eine quantitative Analyse naturräumlicher und sozio-ökonomischer Ursachen unter besonderer Berücksichtigung des Agrarstrukturwandels. Schlussbericht. Eidgenössische Forschungsanstalt für Wald, Schnee und Landschaft, Birmensdorf, 65 pp. Available at: www.wsl.ch/dienstleistungen/publikationen/pdf/7851.pdf (accessed on 1 August 2015).
27. Agnoletti M. (2007). – The degradation of traditional landscape in a mountain area of Tuscany during the 19th and 20th centuries: implications for biodiversity and sustainable management. *Forest Ecol. Manag.*, **249** (1-2), 5–17. doi:10.1016/j.foreco.2007.05.032.
28. Lasanta T., Arnáez J., Errea M.P., Ortigosa L. & Ruiz-Flaño P. (2009). – Mountain pastures, environmental degradation, and landscape remediation: the example of a Mediterranean policy initiative. *Appl. Geogr.*, **29** (3), 308–319. doi:10.1016/j.apgeog.2008.09.006.
29. Chételat J., Kalbermatten M., Lannas K.S.M., Spiegelberger T., Wettstein J.B., Gillet F., Peringer A. & Buttler A. (2013). – A contextual analysis of land-use and vegetation changes in two wooded pastures in the Swiss Jura Mountains. *Ecol. Soc.*, **18** (1), 39. doi:10.5751/es-05287-180139.
30. Komac B., Kefi S., Nuche P., Escós J. & Alados C.L. (2013). – Modeling shrub encroachment in subalpine grasslands under different environmental and management scenarios. *J. Environ. Manag.*, **121**, 160–169. doi:10.1016/j.jenvman.2013.01.038.
31. Hadjigeorgiou I. (2011). – Past, present and future of pastoralism in Greece. *Pastoralism: Res., Pol., Pract.*, **1**, 24. doi:10.1186/2041-7136-1-24.
32. Moreira F., Rego F.C. & Ferreira P.G. (2001). – Temporal (1958–1995) pattern of change in a cultural landscape of northwestern Portugal: implications for fire occurrence. *Landscape Ecol.*, **16** (6), 557–567. doi:10.1023/A:1013130528470.
33. Brown K.M. (2003). – New challenges for old commons: the implications of rural change forcrofting common grazings. *Landscape, law and justice: Proceedings from a workshop on old and new commons*, 11-13 March 2003, Centre for Advanced Study, Oslo.
34. Kovarik P., Kutal M. & Machar I. (2014). – Sheep and wolves: is the occurrence of large predators a limiting factor for sheep grazing in the Czech Carpathians? *J. Nat. Conserv.*, **22** (5), 479–486. doi:10.1016/j.jnc.2014.06.001.

35. Dressel S., Sandström C. & Ericsson G. (2015). – A meta-analysis of studies on attitudes toward bears and wolves across Europe 1976–2012. *Conserv. Biol.*, **29** (2), 565–574. doi:10.1111/cobi.12420.
36. Bryn A. (2004). – The mountain summer farm landscape of Innfjorden, Western Norway. In *Transhumance and biodiversity in European mountains*. Report of the EU-FP5 project TRANSHUMOUNT (EVK2-CT-2002-80017) (R.G.H. Bunce, M. Pérez-Soba, R.H.G. Jongman, A. Gómez Sal, F. Herzog & I. Austad, eds). IALE Publication Series, No. 1, 321 pp. Available at: www.researchgate.net/publication/40125001_Transhumance_and_biodiversity_in_European_mountains (accessed on 1 August 2015).
37. Clément P. (1991). – En Cévennes avec les bergers – récits de transhumance. Presse du Languedoc / Max Chaleil éditeur, Sète, France, 232 pp.
38. Huband S., McCracken D.I. & Mertens A. (2010). – Long and short-distance transhumant pastoralism in Romania: past and present drivers of change. *Pastoralism: Res., Pol., Pract.*, **1** (1), 55–71.
39. Brisebarre A.-M. (1994). – La transhumance ovine en Lozère, impact de la brucellose sur l'organisation des troupeaux. In *L'homme et le mouton dans l'espace de la transhumance* (J.-C. Duclos & A. Pitte, eds). Glénat, Paris, 221–230.
40. Sutcliffe L.M.E., Paulini I., Jones G., Marggraf R. & Page N. (2013). – Pastoral commons use in Romania and the role of the Common Agricultural Policy. *Int. J. Commons*, **7** (1), 58–72. doi:10.18352/ijc.367.
41. European Crop Protection (2016). – Common Agricultural Policy (CAP). Available at: www.ecpa.eu/information-page/agriculture-today/common-agricultural-policy-cap (accessed on 30 May 2016).
42. Kerven C. & Behnke R. (2011). – Policies and practices of pastoralism in Europe. *Pastoralism: Res., Pol., Pract.*, **1** (1), 28. doi:10.1186/2041-7136-1-28.
43. Huyghe C., De Vlieghe A., van Gils B. & Peeters A. (eds) (2014). – Grasslands and herbivore production in Europe and effects of common policies. Editions Quae, Versailles, 323 pp.
44. Agriculture and Rural Payments Agency (2015). – Measure 212 – Less Favoured Areas (LFA). Available at: <http://secure2.gov.mt/MRRA-PA/m212-lfa?l=1> (accessed on 14 August 2015).
45. Agriculture and Rural Payments Agency (2015). – Measure 214 – Agri-Environmental Measures (AEM) (RDP 07-13). Available at: <http://secure2.gov.mt/MRRA-PA/m214-aem?l=1> (accessed on 14 August 2015).
46. Olmeda C., Keenleyside C., Tucker G. & Underwood E. (2014). – Farming for Natura 2000. European Commission. Institute for European Environmental Policy, London, 145 pp.
47. European Commission (2013). – CAP reform: an explanation of the main elements. Available at: http://europa.eu/rapid/press-release_MEMO-13-621_en.htm (accessed on 14 August 2015).
48. European Commission (2013). – Overview of CAP reform 2014–2020. Agricultural Policy Perspectives Brief No. 5, December 2013. Available at: http://ec.europa.eu/agriculture/policy-perspectives/policy-briefs/index_en.htm (accessed on 1 August 2015).
49. Oteros-Rozas E., Martín-López B., López-Santiago C.A., Palomo I. & González J.A. (2013). – Envisioning the future of transhumant pastoralism through participatory scenario planning: a case study in Spain. *Rangeland J.*, **35** (3), 251–272. doi:10.1071/RJ12092.
50. Keenleyside C., Beaufoy G., Tucker G., Jones G. & Underwood E. (2014). – High Nature Value farming throughout the EU-27 and its financial support under the CAP. Final Report. Institute for European Environmental Policy, London, 420 pp.
51. Ministère de l'agriculture et de la pêche (2016). – Programme de développement rural hexagonal 2007–2013. République Française. Available at: <http://agriculture.gouv.fr/leader-2007-2013-le-programme-de-developpement-rural-hexagonal-pdrh> (accessed on 30 May 2016).
52. Cooper T., Baldock D., Rayment D., Kuhmonen M., Terluin I., Swales V., Poux X., Zakeossian D. & Farmer M. (2006). – An evaluation of the Less Favoured Area measure in the 25 Member States of the European Union. Institute for European Environmental Policy, London, 262 pp.
53. Beaufoy G., Keenleyside C. & Oppermann R. (2012). – How should the EU and national policies support HNV farming? In *High Nature Value farming in Europe* (R. Oppermann, G. Beaufoy & G. Jones, eds). Verlag Regionalkultur, Basel, 525–535.
54. Luick R., Jedicke E. & Metzner J. (2015). – Extensive Beweidung von Grünland: Auswirkungen der neuen Gemeinsamen Agrarpolitik der EU. *Natur und Landschaft*, **90** (6), 283–289.
55. Beaufoy G. & Marsden K. (2010). – CAP reform 2013: last chance to stop the decline of Europe's High Nature Value farming. Available at: www.efncp.org/download/policy-cap-reform-2013.pdf (accessed on 14 August 2015).
56. Federal Office for Agriculture (Switzerland) (2015). – Verordnungspaket AP 14–17. Available at: www.blw.admin.ch/themen/00005/01684/index.html?lang=de (accessed on 1 August 2015).
57. Organisation for Economic Co-operation and Development (OECD) (2015). – OECD Review of Agricultural Policies: Switzerland 2015. OECD Publishing, Paris. doi:10.1787/9789264168039-en.

58. Federal Office for Agriculture (Switzerland) (2015). – Direct payments. Available at: www.blw.admin.ch/themen/00006/index.html?lang=en (accessed on 1 August 2015).
59. Meier T. (2013). – Ausführungsbestimmungen der Agrarpolitik 2014-2017. *Agrarforschung Schweiz*, **4** (11-12), 492–497.
60. Federal Assembly of the Swiss Confederation (2007). – Verordnung über Sömmerungsbeiträge 910.133 (Sömmerungsbeitragsverordnung, SöBV) vom 14. November 2007. Available at: www.admin.ch/opc/de/official-compilation/2007/6139.pdf (accessed on 1 August 2015).
61. Lauber S., Böni R., Calabrese C., Fischer M., Schulz T. & von Felten S. (2013). – Agrarpolitik und Alpwirtschaft: Chancen und Risiken. In *Zukunft der Schweizer Alpwirtschaft. Fakten, Analysen und Denkanstöße aus dem Forschungsprogramm AlpFUTUR* (S. Lauber, F. Herzog, I. Seidl, R. Böni, M. Bürgi, P. Gmür, G. Hofer, S. Mann, M. Raaflaub, M. Schick, M. Schneider & R. Wunderli, eds). Eidg. Forschungsanstalt WSL, Birmensdorf; Forschungsanstalt Agroscope Reckenholz-Tänikon (ART), Zürich-Reckenholz, 155–165. Available at: www.wsl.ch/ebooks/alpfutur/de (accessed on 1 August 2015).
62. Landolt G. & Haller T. (2015). – Alpine common property institutions under change: conditions for successful and unsuccessful collective action by Alpine farmers in the Canton of Grisons, Switzerland. *Hum. Organ.*, **74** (1), 100–111. doi:10.17730/humo.74.1.x55m464806q67156.
63. Schulz T. (2011). – Ex-post Wirkungsanalyse und Vollzugsanalyse der Sömmerungsbeitragsverordnung (SöBV). Technischer Bericht aus dem AlpFUTUR-Teilprojekt 13 'Politikanalyse' – Evaluation bestehender und alternativer Steuerungsinstrumente für das Sömmerungsgebiet. Eidg. Forschungsanstalt für Wald, Schnee und Landschaft, Birmensdorf, 119 pp. Available at: www.wsl.ch/publikationen/pdf/10914.pdf (accessed on 1 August 2015).
64. Mack G. & Flury C. (2008). – Wirkung der Sömmerungsbeiträge. *Agrarforschung*, **15** (10), 500–505.
65. Calabrese C., Mack G. & Mann S. (2011). – Ex-ante Analyse der Politikinstrumente für die Sömmerungsgebiete in der Schweiz mittels eines Multiagentenmodells. Schlussbericht des Moduls 8 des AlpFUTUR-Teilprojektes 13 «Politikanalyse». Agroscope ART, Ettenhausen, Switzerland, 30 pp.
66. Bürgi M., Wunderli R. & Furrer B. (2013). – Die Entstehung der modernen Alpwirtschaft. In *Zukunft der Schweizer Alpwirtschaft. Fakten, Analysen und Denkanstöße aus dem Forschungsprogramm AlpFUTUR* (S. Lauber, F. Herzog, I. Seidl, R. Böni, M. Bürgi, P. Gmür, G. Hofer, S. Mann, M. Raaflaub, M. Schick, M. Schneider & R. Wunderli, eds). Eidg. Forschungsanstalt WSL, Birmensdorf; Forschungsanstalt Agroscope Reckenholz-Tänikon (ART), Zürich-Reckenholz, 36–53. Available at: www.wsl.ch/ebooks/alpfutur/de (accessed on 1 August 2015).
67. Hitz F. (2009). – Alpen, Kapitel 3.1: Landwirtschaft im Mittelalter. In *Historisches Lexikon der Schweiz (HLS)*, Version vom 21.10.2009. Available at: www.hls-dhs-dss.ch/textes/d/D8569.php (accessed on 1 August 2015).
68. Nägeli-Oertle R. (1986). – Die Berglandwirtschaft und Alpwirtschaft in Grindelwald. Schlussberichte zum Schweizerischen MAB-Programm. Nr. 21. Bundesamt für Umweltschutz, Bern.
69. Municipality of Grindelwald (2002). – Taleinungsbrief. Statuten über die Organisation der Alpen der Talschaft Grindelwald. Grindelwald, Switzerland.
70. Baur I., Liechti K. & Binder C.R. (2014). – Why do individuals behave differently in commons dilemmas? The case of alpine farmers using common property pastures in Grindelwald, Switzerland. *Int. J. Commons*, **8** (2), 657–685. doi:10.18352/ijc.469.
71. Herzog F., Oehen B., Raaflaub M. & Szerencsits E. (2013). – Warum es die Alpwirtschaft nicht gibt: Versuch einer Beschreibung. In *Zukunft der Schweizer Alpwirtschaft. Fakten, Analysen und Denkanstöße aus dem Forschungsprogramm AlpFUTUR* (S. Lauber, F. Herzog, I. Seidl, R. Böni, M. Bürgi, P. Gmür, G. Hofer, S. Mann, M. Raaflaub, M. Schick, M. Schneider & R. Wunderli, eds). Eidg. Forschungsanstalt WSL, Birmensdorf; Forschungsanstalt Agroscope Reckenholz-Tänikon (ART), Zürich-Reckenholz, 18–35. Available at: www.wsl.ch/ebooks/alpfutur/de (accessed on 1 August 2015).
72. Swiss Federal Statistical Office (FSO) (2013). – Land use in Switzerland. Results of the Swiss land use statistics. FSO, Neuchâtel.
73. Swiss Federal Office for Agriculture (FOAG) (2014). – Agrarbericht. FOAG, Berne, 312 pp. Available at: www.blw.admin.ch/dokumentation/00018/00498/index.html?lang=de (accessed on 1 August 2015).
74. Schneider M., Homburger H., Landolt G., Imflod-Müller S. & Müller Wahl P. (2013). – Alpweiden: Geprägt durch Mensch, Tier und Umwelt. In *Zukunft der Schweizer Alpwirtschaft. Fakten, Analysen und Denkanstöße aus dem Forschungsprogramm AlpFUTUR* (S. Lauber, F. Herzog, I. Seidl, R. Böni, M. Bürgi, P. Gmür, G. Hofer, S. Mann, M. Raaflaub, M. Schick, M. Schneider & R. Wunderli, eds). Eidg. Forschungsanstalt WSL, Birmensdorf; Forschungsanstalt Agroscope Reckenholz-Tänikon (ART), Zürich-Reckenholz, 54–67. Available at: www.wsl.ch/ebooks/alpfutur/de (accessed on 1 August 2015).
75. Seidl I., Böni R., Junge X., Landolt G. & Schüpbach B. (2013). – Alpwirtschaft – für die Gesellschaft mehr als ein Werbesujet. In *Zukunft der Schweizer Alpwirtschaft. Fakten, Analysen und Denkanstöße aus dem Forschungsprogramm AlpFUTUR* (S. Lauber, F. Herzog, I. Seidl, R. Böni, M. Bürgi, P. Gmür, G. Hofer, S. Mann, M. Raaflaub, M. Schick, M. Schneider & R. Wunderli, eds). Eidg. Forschungsanstalt WSL, Birmensdorf; Forschungsanstalt Agroscope Reckenholz-Tänikon (ART), Zürich-Reckenholz, 136–149. Available at: www.wsl.ch/ebooks/alpfutur/de (accessed on 1 August 2015).

76. Von Felten S., Fischer M. & Lauber S. (2012). – Alpwirtschaft in der Schweiz: Befragungen zu Situation und Wahl der Sömmerungsbetriebe. *Agrarforschung Schweiz*, **3** (4), 186–193.
77. Schweizer A. (2001). – ‘Von StädterInnen, die z’Alp gehen’: Beschreibung der Lebenswelten von ‘städtischen’ ÄlpplerInnen mit Anregungen aus der Theorie des Konstruktivismus. Diplomarbeit am Geographischen Institut der Universität Bern, 155 pp.
78. Stöcklin J., Bosshard A., Klaus G., Rudmann-Maurer K. & Fischer M. (2007). – Landnutzung und biologische Vielfalt in den Alpen. Thematische Synthese zum Forschungsschwerpunkt II ‘Land- und Forstwirtschaft im alpinen Lebensraum’ des Nationalen Forschungsprogramms NFP 48, ‘Landschaften und Lebensräume der Alpen’. vdf Hochschulverlag AG, Zürich.
79. Bebi P. & Baur P. (2002). – Forest expansion in the Swiss Alps: a quantitative analysis of bio-physical and socio-economic causes. *Austrian J. Forest Sci.*, **119** (3/4), 217–230.
80. Gellrich M. (2006). – Natural forest re-growth on abandoned agricultural land in the Swiss mountains. An economic analysis of patterns and causes using spatial statistical models and interviews. PhD thesis. Faculty of Forest and Environmental Sciences, University of Freiburg im Breisgau, Germany.
81. Mack G., Walter T. & Flury C. (2013). – Seasonal alpine grazing trends in Switzerland: economic importance and impact on biotic communities. *Environ. Sci. Policy*, **32**, 48–57. doi:10.1016/j.envsci.2013.01.019.
82. Hofer G., Junge X., Koch B. & Schüpbach B. (2013). – Einzigartige Kulturlandschaft und Artenvielfalt im Sömmerungsgebiet. In *Zukunft der Schweizer Alpwirtschaft. Fakten, Analysen und Denkanstöße aus dem Forschungsprogramm AlpFUTUR* (S. Lauber, F. Herzog, I. Seidl, R. Böni, M. Bürgi, P. Gmür, G. Hofer, S. Mann, M. Raaflaub, M. Schick, M. Schneider & R. Wunderli, eds). Eidg. Forschungsanstalt WSL, Birmensdorf; Forschungsanstalt Agroscope Reckenholz-Tänikon (ART), Zürich-Reckenholz, 122–135. Available at: www.wsl.ch/ebooks/alpfutur/de (accessed on 1 August 2015).
83. Idu P.D. (1999). – Om si natura in Carpatii Maramuresului si Bucovinei – Viata Pastorală [Man and nature in the Maramures and Bucovina Carpathians – Pastoral Life]. Napoca Star, Cluj, Romania.
84. Hartel T., Fischer J., Câmpeanu C., Milcu A.I., Hanspach J. & Fazey I. (2014). – The importance of ecosystem services for rural inhabitants in a changing cultural landscape in Romania. *Ecol. Soc.*, **19** (2), 42. doi:10.5751/es-06333-190242.
85. Babai D. & Molnár Z. (2014). – Small-scale traditional management of highly species-rich grasslands in the Carpathians. *Agric. Ecosyst. Environ.*, **182**, 123–130. doi:10.1016/j.agee.2013.08.018.
86. Wilson O.J. (1997). – Common cause or common concern? The role of common lands in the post-productivist countryside. *Area*, **29** (1), 45–58. doi:10.1111/j.1475-4762.1997.tb00006.x.
87. Fjellstad W., Dramstad W. & Stensgaard K. (2012). – Norge. In *High Nature Value farming in Europe* (R. Oppermann, G. Beaufoy & G. Jones, eds). Verlag Regionalkultur, Basel.
88. Wehn S., Pedersen B. & Hanssen S.K. (2011). – A comparison of influences of cattle, goat, sheep and reindeer on vegetation changes in mountain cultural landscapes in Norway. *Landsc. Urban Plan.*, **102** (3), 177–187. doi:10.1016/j.landurbplan.2011.04.003.
89. Ministry of Agriculture and Food (Norway) (2008). – Environmental Strategy 2008–2015. Available at: www.regjeringen.no/globalassets/upload/lmd/vedlegg/brosjyurer_veiledere_rapporter/miljostrategi_2008_2015_m_0739_b_engelsk.pdf (accessed on 1 August 2015).
90. Kvakkestad V., Rørstad P.K. & Vatn A. (2015). – Norwegian farmers’ perspectives on agriculture and agricultural payments: between productivism and cultural landscapes. *Land Use Policy*, **42**, 83–92. doi:10.1016/j.landusepol.2014.07.009.
91. Organisation for Economic Co-operation and Development (OECD) (2014). – Developments in agricultural policies and support in Norway. In *Agricultural policy monitoring and evaluation 2014: OECD Countries*. OECD Publishing, Paris. doi:10.1787/agr_pol-2014-16-en.
92. Daugstad K., Mier M.F. & Pena-Chocarro L. (2014). – Landscapes of transhumance in Norway and Spain: farmers’ practices, perceptions, and value orientations. *Norsk Geografisk Tidsskrift – Norw. J. Geogr.*, **68** (4), 248–258. doi:10.1080/00291951.2014.927395.
93. Moe D. (2004). – Contribution to the prehistory of the use of summer farms in Southern Norway. In *Transhumance and biodiversity in European mountains*. Report of the EU-FP5 project TRANSHUMOUNT (EVK2-CT-2002-80017) (R.G.H. Bunce, M. Pérez-Soba, R.H.G. Jongman, A. Gómez Sal, F. Herzog & I. Austad, eds). IALE Publication Series No. 1, 321 pp. Available at: www.researchgate.net/publication/40125001_Transhumance_and_biodiversity_in_European_mountains (accessed on 1 August 2015).
94. Moe D., Indrelid S. & Fasteland A. (1988). – The Halne Area, Hardangervidda. Use of a high mountain area during 5000 years – an interdisciplinary case study. In *The cultural landscape: past, present and future* (H.H. Birks, H.J.B. Birks, P.E. Kaland & D. Moe, eds). Cambridge University Press, Cambridge, 429–444.
95. Austad I., Norderhaug A., Hauge L. & Moen A. (2004). – An overview of Norwegian summer farming. In *Transhumance and biodiversity in European mountains*. Report of the EU-FP5 project TRANSHUMOUNT (EVK2-CT-2002-80017) (R.G.H. Bunce, M. Pérez-Soba, R.H.G. Jongman, A. Gómez Sal, F. Herzog & I. Austad, eds). IALE Publication Series No. 1, 321 pp. Available at: www.researchgate.net/publication/40125001_Transhumance_and_biodiversity_in_European_mountains (accessed on 1 August 2015).
96. Daugstad K. & Sæter S. (2001). – Seterliv. Det norske samlaget, Oslo. Antall pensumsider: 23 Kap. Bymann og bonde, s.73–95.

97. Timberlid J.A. (1990). – Driftsendringer i jordbruket som årsak til forsurening av norske vassdrag? Ein samanliknande studie av utmarksbruket på Vest- og Sørlandet i perioden 1850–1980. Økoforsk rapport, 354 pp.
98. Potthoff K. & Eiter S. (2004). – Transhumance in the Stølsheimen mountain area, western Norway. In Transhumance and biodiversity in European mountains. Report of the EU-FP5 project TRANSHUMOUNT (EVK2-CT-2002-80017) (R.G.H. Bunce, M. Pérez-Soba, R.H.G. Jongman, A. Gómez Sal, F. Herzog & I. Austad, eds). IALE Publication Series No. 1, 321 pp. Available at: www.researchgate.net/publication/40125001_Transhumance_and_biodiversity_in_European_mountains (accessed on 14 August 2015).
99. Bryn A. (2008). – Recent forest limit changes in south-east Norway: effects of climate change or regrowth after abandoned utilisation? *Norsk Geografisk Tidsskrift – Norw. J. Geogr.*, **62** (4), 251–270.
100. Daugstad K., Rønningen K. & Skar B. (2006). – Agriculture as an upholder of cultural heritage? Conceptualizations and value judgements: a Norwegian perspective in international context. *J. Rur. Stud.*, **22** (1), 67–81. doi:10.1016/j.jrurstud.2005.06.002.
101. Ulvevadet B. & Hausner V.H. (2011). – Incentives and regulations to reconcile conservation and development: thirty years of governance of the Sami pastoral ecosystem in Finnmark, Norway. *J. Environ. Manag.*, **92** (10), 2794–2802. doi:10.1016/j.jenvman.2011.06.026.
102. Riseth J.A. & Vatn A. (2009). – Modernization and pasture degradation: a comparative study of two Sámi reindeer pasture regions in Norway. *Land Economics*, **85** (1), 87–106. doi:10.3368/le.85.1.87.
103. Jones G., Dunford B., McGurn P., Boyle P., Hayes M., Gormally M. & Moran J. (2012). – Ireland. In High Nature Value farming in Europe (R. Oppermann, G. Beaufoy & G. Jones, eds). Verlag Regionalkultur, Basel, 254–261.
104. Moran J. (2010). – From Gaelic pastoral systems to CAP supported extensive livestock production. Institute of Technology, Sligo, Ireland, 33 pp.
105. Dunford B. (2002). – Farming and the Burren. Teagasc Publications, Carlow, Ireland, 108 pp.
106. Burrenbeo Trust (2015). – What is winterage? Available at: www.burrenwinterage.com/#!about-winterage/c1xc9 (accessed on 14 August 2015).
107. Beaufoy G., Caballero R. & Oñate J.J. (2012). – Spain. In High Nature Value farming in Europe (R. Oppermann, G. Beaufoy & G. Jones, eds). Verlag Regionalkultur, Basel, 382–405.
108. Otero F.A. (2003). – Algunos aspectos de la relaciones entre el trazado de la vías pecurias y el medio físico. In Las vías pecurias del Reino de España: un patrimonio natural y cultural europeo (J.M. Casas, ed.). Ministerio del Medio Ambiente, Madrid, 159–180.
109. United Nations Educational, Scientific and Cultural Organization (UNESCO) (2003). – Picos de Europa. Available at: www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/europe-north-america/spain/picos-de-europa (accessed on 14 August 2015).
110. Pastores de los Picos de Europa (2016). – Pastores de los Picos de Europa. Available at: www.quesogamonedo.com/index.php?option=com_content&view=article&id=122&Itemid=59&lang=es (accessed on 30 May 2016).
111. Brisebarre A.-M. (1978). – Bergers des Cévennes. Histoire et ethnographie du monde pastoral et de la transhumance en Cévennes. Espace Sud, Montpellier, 198 pp.
112. Biber J.-P. (2010). – Transhumance in France. *Pastoralism: Res., Pol., Pract.*, **1** (1), 91–98.
113. Villien C., Poux X. & Pointereau P. (2014). – L'agriculture à 'Haute Valeur Naturelle' en France métropolitaine. Un indicateur pour le suivi de la biodiversité et l'évaluation de la politique de développement rural. Analyse n° 75. Centre d'Études et de Prospective, Paris, 1–4. Available at: <http://agreste.agriculture.gouv.fr/IMG/pdf/analyse751411.pdf> (accessed on 16 May 2016).
114. Fabre P. (2000) – Hommes de la Crau – des coussouls aux alpages. Éditions Cheminements, Coudray-Macouard, France, 309 pp.
115. Parcs nationaux de France (2010). – Alpages et estives dans les parcs nationaux métropolitains de montagne. Parcs nationaux de France, Montpellier, 24 pp.
116. Fabre P. (2015). – La Routo, sur les pas de la transhumance: mise en œuvre et animation d'un itinéraire et d'un réseau transfrontalier de valorisation des métiers, des produits et des patrimoines de la transhumance. *Pastum*, **103**, 6–10.
117. Chazaud P. (2011). – Étude sur la réalité des liens transfrontaliers entre la France, l'Espagne et l'Andorre. Rapport final 14.10.2011. Préfecture de la Région Midi-Pyrénées, 116 pp.
118. Garde L., Bataille J.-F., Brunschwig G., Dimanche M. & Lasseur J. (eds) (2007). – Loup, élevage – s'ouvrir à la complexité. CERPAM, Manosque, France, 251 pp.
119. SupAgro Montpellier (2014). – Centre de formation du Merle – BPA berger transhumant. Available at: www.supagro.fr/web/pages/?id1=19&page=233&id_page=199 (accessed on 14 August 2015).
120. Hirsch Hadorn G., Hoffmann-Riem H., Biber-Klemm S., Grossenbacher-Mansuy W., Joye D., Pohl C., Wiesmann U. & Zemp E. (eds) (2008). – Handbook of transdisciplinary research. Springer, Berlin, 448 pp. doi:10.1007/978-1-4020-6699-3.

