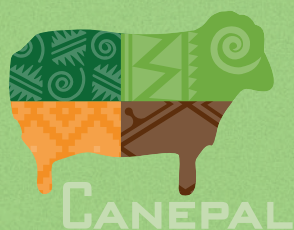




SHEEP

AND THE LANDSCAPE



Education and Culture DG
Culture Programme

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CULTURE AND NATURE: THE EUROPEAN HERITAGE OF
SHEEP FARMING AND PASTORAL LIFE

SHEEP AND THE LANDSCAPE

SYNTHESIS REPORT

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Estonian University of Life Sciences

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Culture Programme



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Front cover photo: Sheep on Iceland. Source: Audrey, Flickr, CC BY 2.0

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INTRODUCTION

This report presents an overview of the way that sheep farming has have affected and continues to affect the European landscape as seen from the perspective of the countries participating in the CANEPAL project. Of course, these are not completely representative of all European landscapes but do cover some of the main regions with different broad landscape types, varying as a result of different climates, vegetation, sheep breeds, sheep husbandry methods and histories. It is perhaps noteworthy that sheep, one of the first animals to be domesticated in the middle or near east, continue to be managed in ways that would in many cases be recognisable to our forebears from many hundreds or even thousands of years ago – not something that can be said in the same way for pigs and cattle. Sheep still roam widely in large scale open landscapes, transhumance is still practised in some areas and shepherds still follow many of the old ways of managing flocks and making cheese and other products. Thus, the landscapes produced and maintained by and for sheep (and to a lesser extent goat) husbandry are a significant component of the cultural landscape, which has strong connections over space and time and, it seems, are quite resilient to the changes that have affected many other branches of agriculture.

This is not to say that pastoral landscapes are unchanging or unthreatened by modern life or economics, far from it. There are fewer people willing to take on the life of a shepherd or sheep farmer and many of the skills needed to look after the landscape and the elements such as sheep folds, walls and huts which form such an important part of the sheep-based culture are at risk of being lost. The effects of the Common Agricultural Policy have in some cases put landscapes at risk by encouraging overstocking, although the more recent regimes have addressed this to some degree. The economic basis for much of sheep farming and herding is precarious, especially in remote and marginal areas and the life of a shepherd can be lonely and poorly rewarded, considered to be of low social status by many people and thus not very attractive unless there is sheep farming “in the blood”, as there seems to be – otherwise why would anyone suffer themselves to turn out at night in the freezing rain to attend to a lambing ewe or to spend all day by themselves away from company?

The landscapes associated with sheep are extensive, covering significant proportions of upland and mountain areas in Europe where other forms of pastoral agriculture or cropping are not suitable. Sheep, being grazing and not browsing animals, eat plants differently from goats, which are much more omnivorous and less selective, and because they use their teeth they graze more closely than cattle, which wrap their tongues around grass and can only eat longer growth. They are less picky than horses too, so the sheep grazed grassy landscape takes on a certain quality of closely nibbled turf. While this prevents many plants from surviving and, while it is kept up, ensures that scrub or forest does not re-colonise an area, it also allows other plants to thrive and so creates special biotopes which need to be grazed (at a certain level of intensity anyway) in order to be maintained. Sheep also need hay in the winter and access to feed crops in some places so that as well as the grazed areas the associated in-bye meadows and crop lands, especially in lowland areas, form part of the landscape.

Sheep do not only eat grass and in many places other plants form their diet, such as heather (*Calluna vulgaris*), seaweed, mosses and lichens, Mediterranean herbs and so on, depending on the country or region. These can also form special landscapes, especially when they are relatively unusual or rare. Thus the pastoral landscape of sheep farming is one class of landscape types with a lot of variety but also some common features that sets it apart from the cultivated, forested or urban landscapes which also cover large proportions of the continent. Some countries, such as the UK, Ireland and Iceland have been deforested for many hundreds if not thousands of years as a result of browsing and graz-

ing animals, mainly sheep as well as clearance for agriculture. Others such as those with Alps, Pyrenees, Balkan or Carpathian mountains have used areas with naturally open or sparsely tree-covered landscapes for pastoral agriculture, also for centuries or millennia, and owing to the distance of such areas from the main settlement areas these have become in some cases transhumance landscapes. In other countries, such as Estonia, sheep only ever played a small role among the rest of agriculture so that the extent to which pastoral landscapes exist has depended more on their niche function in utilising places such as alvars where other forms of agriculture was not possible. In many other areas sheep husbandry partly at least takes place in lowland mixed farming regions where their influence in the landscape is difficult to separate from the other crops or animals grown there. In yet other areas open pastoral landscapes have been replaced with enclosed fields and the land converted to other forms of crop production so that the qualities associated with pastoralism have been lost.

In this report the term landscape is used in two ways – the definition provided by the European Landscape Convention which emphasises the perceptual and cultural qualities of landscape and that of landscape ecology which focuses on the role of landscape as a scale of ecological planning.

1. THE LANDSCAPE

1.1 Definition

The European Landscape Convention definition

The term landscape has a specific meaning under the terms of the European Landscape Convention (ELC) (Council of Europe 2000): “an area, as perceived by people, whose character is the result of action and interaction of natural and/or human factors”. This demonstrates that the concept of landscape is perceptual at its heart.

The ELC makes the following statements:

“Europe’s countryside, and the people who live in it, are a highly valued and varied asset for the whole population of the continent: the largest part of rural Europe is covered by agricultural land and forests, which have a strong influence on the character of European landscapes;”

“It is our duty to understand, protect and enhance this heritage; at present, in many parts of Europe, the rural heritage is being rapidly eroded and even destroyed by social or technological changes, modern agriculture, urban growth, neglect and other forces”

“With the active participation of the interested parties, as stipulated in Article 5.c, and with a view to improving knowledge of its landscapes, each Party undertakes:

- a) to identify its own landscapes throughout its territory;
 - to analyse their characteristics and the forces and pressures transforming them;
 - to take note of changes;
- b) to assess the landscapes thus identified, taking into account the particular values assigned to them by the interested parties and the population concerned.”

One of the ways that the authorities responsible for the conservation of the landscape have undertaken their task under the ELC is by methodically describing the landscape character of different areas and compiling maps and associated descriptive and guidance documents. This is known as landscape character assessment or LCA and will be used as the framework for the main part of the report.

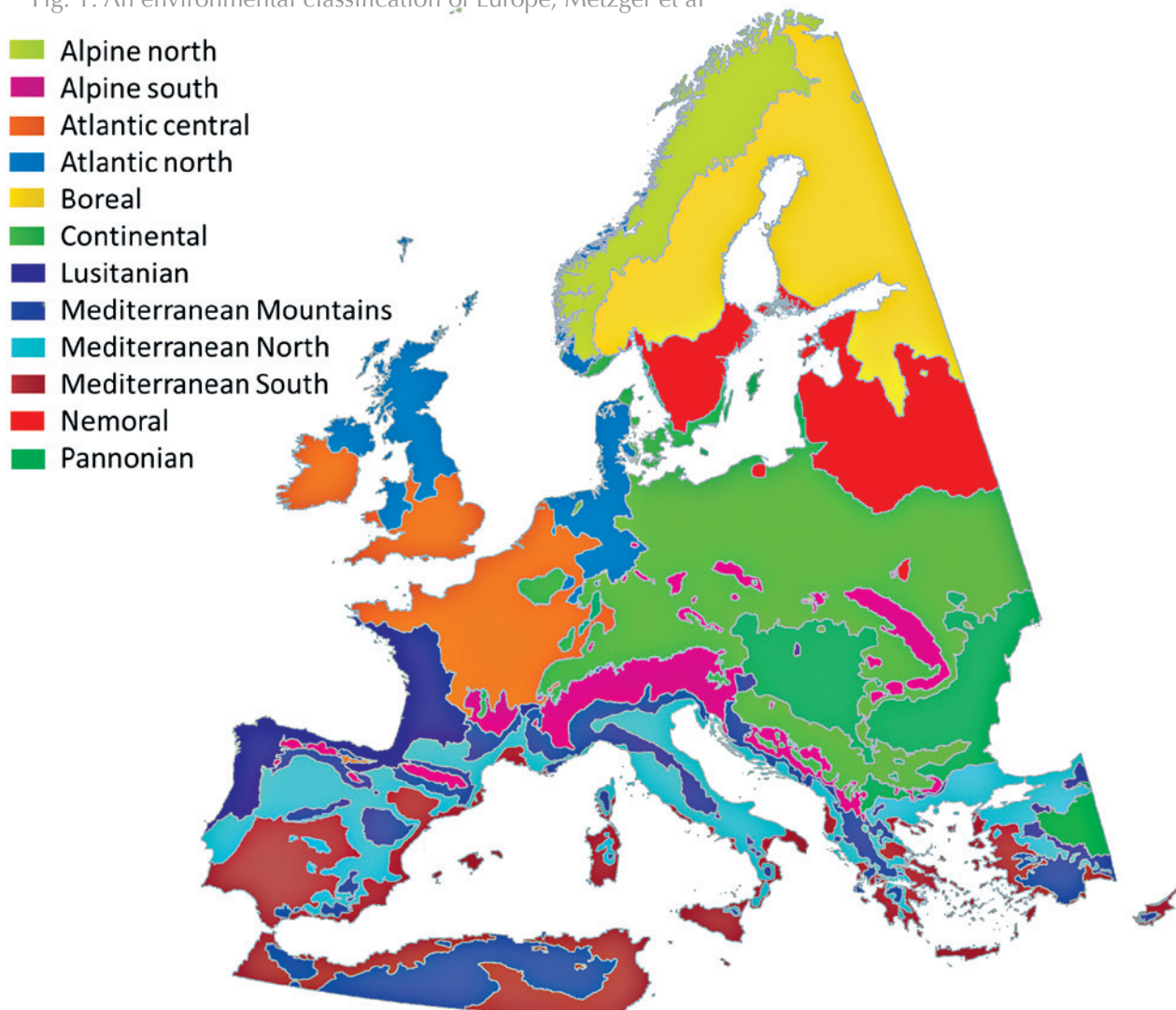
The ecological definition

Landscape ecology is a sub-discipline of ecology that focuses on the spatial patterns of ecological processes. Whereas ecological disciplines often consider processes that create patterns in biota, landscape ecology represents a unique field because it looks at the effect of spatial pattern on ecological processes. The main themes of landscape ecology are heterogeneity, scale, and temporal/spatial relations (Forman and Godron, 1986, Forman, 1995). Some have called landscape ecology the true environmental interdisciplinary science that can bridge the disciplines of biology, geography, and social sciences in order to tackle the problems of environmental degradation.

The main themes comprising landscape ecology include:

- the spatial pattern or structure of landscapes, ranging from wilderness to cities
- the relationship between pattern and process in landscapes, including the ecological implications of pattern for populations, communities, and ecosystems
- the effect of scale on landscape
- the processes involved in pattern formation, such as the physical (abiotic) environment, demographic responses to this, and disturbance regimes

Fig. 1: An environmental classification of Europe, Metzger et al



- the relationship of human activity to landscape pattern, process and change (e.g. applications in land-use planning)

Landscape ecology occurs at a variety of scales, so that a “landscape” may encompass a region composed of multiple ecosystems, or it may constitute the home range of an insect that extends a few metres across, although it also practically means a scale between a region and a habitat/biotope. As well as scale, landscape is defined by the spatial pattern (degree of heterogeneity) and the processes occurring on it such as colonisation and succession and the effects of management by people. Thus, resolution, grain, and extent are important concepts in landscape ecology. With the determination of these aspects of a study, the pattern can be assessed, which is usually described as a mosaic of patches and corridors, possibly set within a matrix. The patch-corridor-matrix model has come to dominate theoretically and the role of corridors facilitating movement of, eg wildlife, at various scales has been a focus of research and policy development as a means of overcoming habitat fragmentation.

There is no reason why these two concepts should be in competition as long as they are understood to be different yet complementary ways of looking at landscapes. In the concept of pastoral landscapes the cultural and perceptual dimension is clearly important but so is the ecological aspect, sometimes positive and sometimes negative, since sheep grazing is one important factor affecting ecosystem processes, especially colonisation and succession and maintaining early successional conditions in many landscapes. However, the fact that sheep grazing has been active in many areas for millennia means that a natural pre-human landscape ideal can no longer be considered to exist, if it ever did. The pastoral landscape is a complete fusion of natural and cultural aspects and should be treated on its own terms.

Ecological aspects will play a secondary role in this report, featuring in the landscapes of some countries more than others.

1.2 The broad classification and characteristics of European landscapes

A starting point for assessing the landscapes of Europe is the map of European Environmental Zones based on a statistical analysis of climate, geomorphology, oceanicity and northing (Metzger et al) which breaks Europe down into some broad categories.

The CANEPAL countries, as far as the main pastoral areas are concerned, fall into the following different zones:

- The UK: Atlantic North and Atlantic Central
- France: Mainly Atlantic Central and Lusitanian with Mediterranean Mountains, Alpine South and Mediterranean North: quite a complex pattern.
- Estonia: a mix of Boreal and Nemoral
- Poland: Continental with a few patches of Alpine South
- Hungary: Pannonian
- Bulgaria: some Pannonian, some Continental and a small amount of Alpine South
- Greece: Mediterranean North and Mediterranean Mountains

This shows that quite a wide range of zones are covered in the CANEPAL project, none being completely repeated.

Landscape Character

Landscape character is defined as “The distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape. (para 7.8, Landscape character assessment guidance for England and Scotland. The Countryside Agency and Scottish Natural Heritage, 2002).

A Landscape character area is a unique geographical area of a particular landscape character type. Landscape character areas take on the names of specific places, such as ‘Galloway uplands’ and ‘Dumfries coastlands’.

Landscape character assessment is the process of systematic description, classification and analysis of landscape, in order to identify, describe and understand its character. The scale and detail of the assessment will depend upon the purpose for which it is being undertaken. (para 7.8, Landscape character assessment guidance for England and Scotland. The Countryside Agency and Scottish Natural Heritage, 2002).

Distinct types of landscape which are generic in character in that they may occur in different parts of a country, but wherever they are they share broadly similar combinations of geology, topography, drainage patterns, vegetation and historical land use and settlement pattern. Names are generic, for example ‘moorland slopes and hills’, ‘open, intensive farmland’ and ‘high cliffs and sheltered bays’.

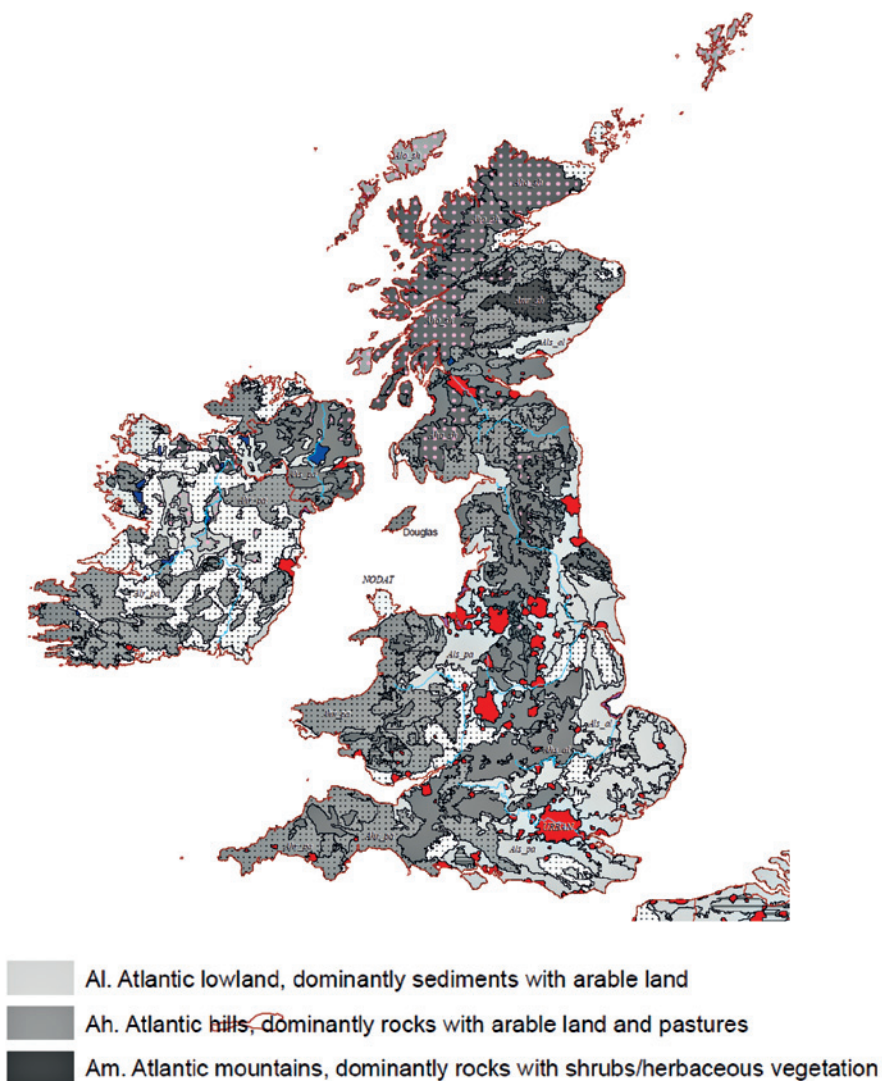


Figure 2: The LANMAP2 division for the British Isles (UK and Ireland)

Landscape classification is the process of identifying the character of different landscapes in any particular area and sorting them into distinctive landscape character types. The landscape character types can be mapped and described in a systematic way at various scales.

Individual CANEPAL countries may or may not have national, regional or local landscape character assessments to call on for use in the project. The UK is well developed in this regard and this is reflected in the national report, France has various assessments which were not used by the national researchers, while Hungary still has a rather old system which has not yet been replaced by a mod-

ern one. For Greece the national report made an attempt to classify landscapes but could not map them all. Therefore it is necessary to use a classification as carried out at a pan-European level as a starting point for comparison using landform and climate as the major classifying aspects in order to give a flavour of the diversity and value of the resource.

A project called LANMAP2 (Mücher et al, 2010) created a single and rather detailed typology for the whole of Europe and which, in the absence of examples from each country carried out to modern standards can be used for comparison purposes. Thus a base map of each CANEPAL country will be presented for comparative purposes (but not to the same scale).

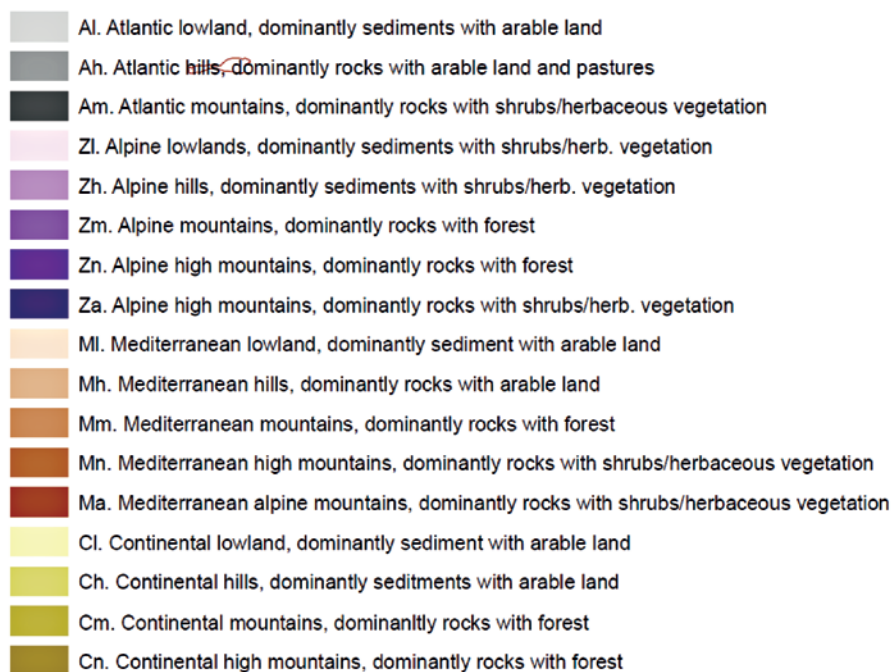
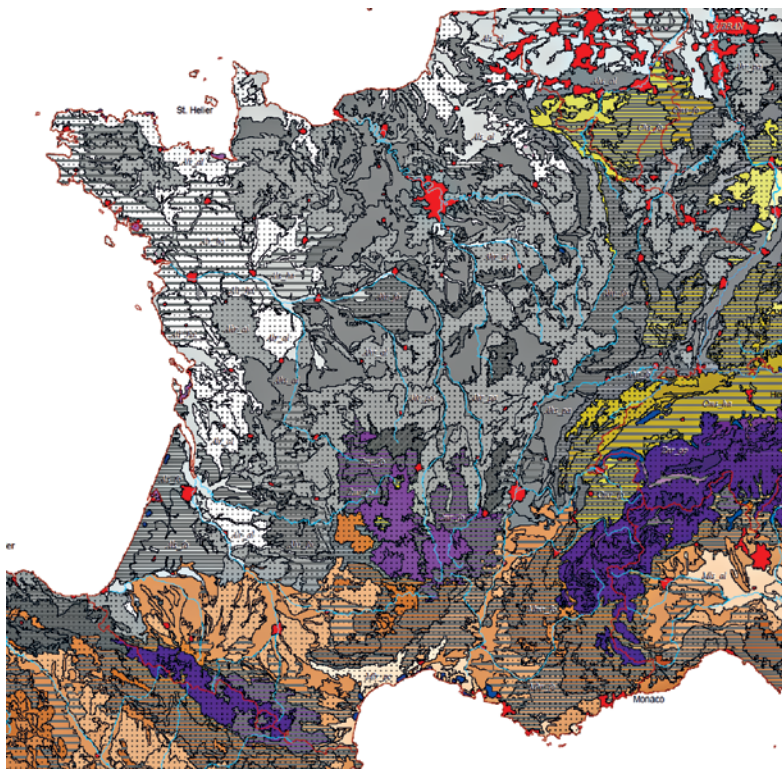
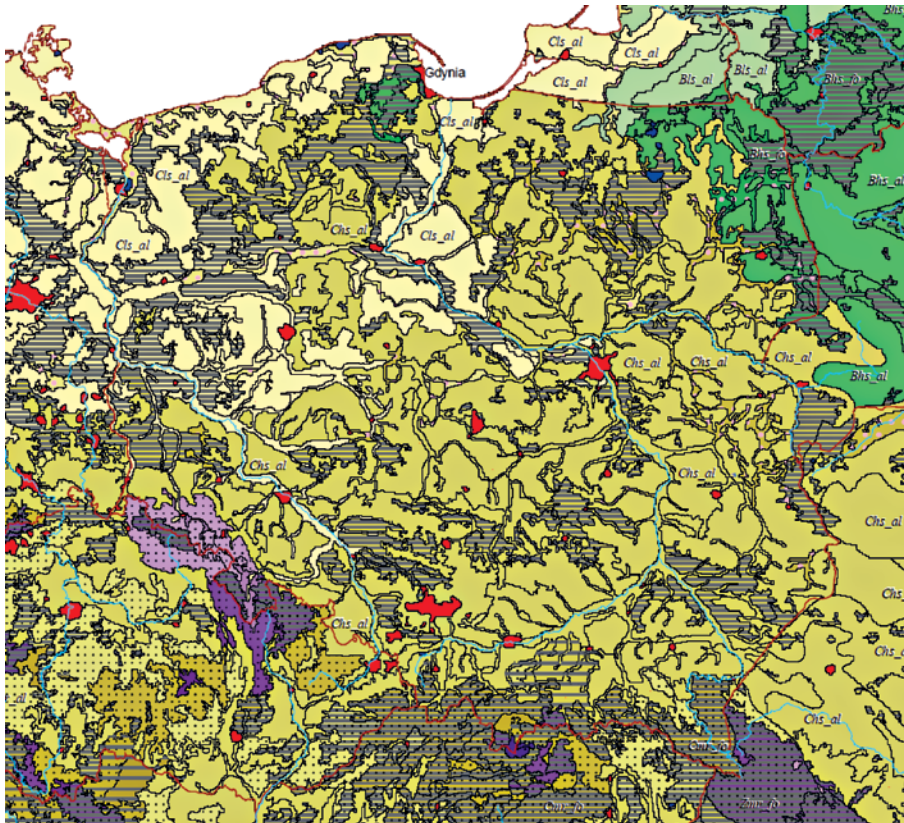


Figure 3: The LANMAP2 image of France

The UK is dominated by an Atlantic oceanic climate and the key shows the Ah type as a mix of pasture and arable and the Am type being dominated by pastoral agriculture, with sheep being the major animal involved. The pink dotted overlay shows the main peat areas which are the north western wetter moorlands.

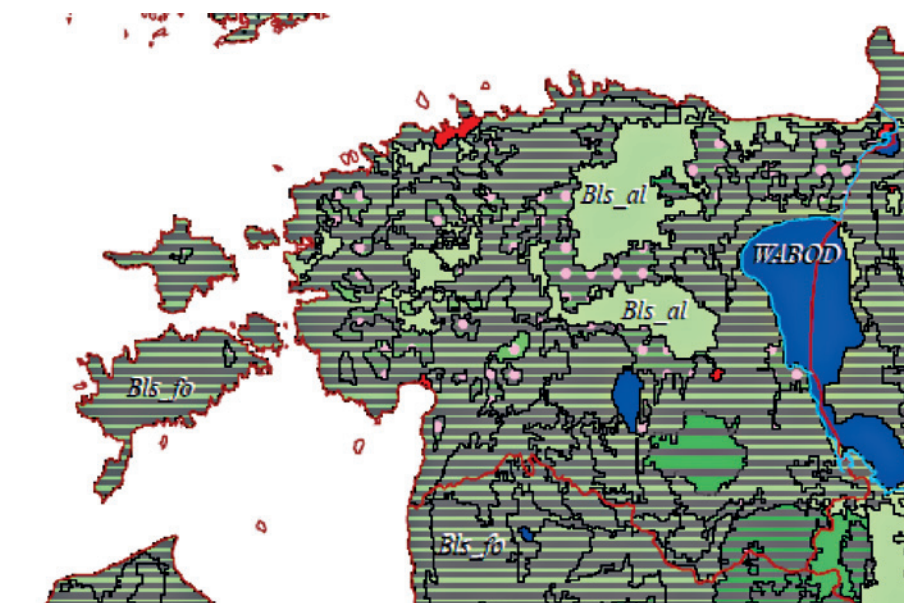
The pastoral areas are mainly in the south in the Pyrenees, the Massif central and the Alps, where rock and forest is shown as dominant in the legend but this misses the presence of pasture as an important element in these areas.



- Cl. Continental lowland, dominantly sediment with arable land
- Ch. Continental hills, dominantly sediments with arable land
- Cm. Continental mountains, dominantly rocks with forest
- Cn. Continental high mountains, dominantly rocks with forest
- Zm. Alpine mountains, dominantly rocks with forest
- Zn. Alpine high mountains, dominantly rocks with forest
- Za. Alpine high mountains, dominantly rocks with shrubs/herb. vegetation

Figure 4: The LANMAP2 Image for Poland

Poland is mainly a low-land continental country with hills and high mountains along the southern border region, which is where the main pastoral areas are to be found. The denser horizontal hatching shows the main forested areas, which in the mountains may also contain pastures.



- Bl. Boreal lowland, dominantly sediment with forest
- Bh. Boreal hills, dominantly sediments with forest

Figure 5: The LANMAP2 Image for Estonia

Estonia is a much smaller country than the others. The legend to the map shows it to be significantly forested with considerable peat areas but mainly flat or a little hilly, making it, like Hungary, different from the other countries.

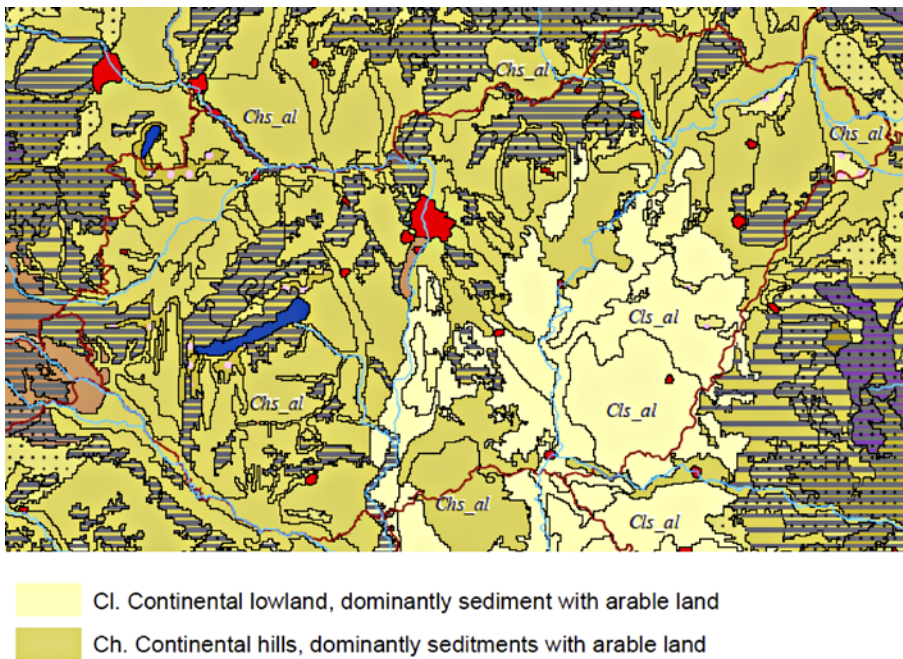


Figure 6: The LANMAP2 Image for Hungary

Hungary is almost all low hills or flat plain and arable with some forest as can be seen from the hatching. This makes it quite different from most of the CANEPAL countries except Estonia, which otherwise are much more hilly or mountainous as far as pastoral landscapes are concerned.

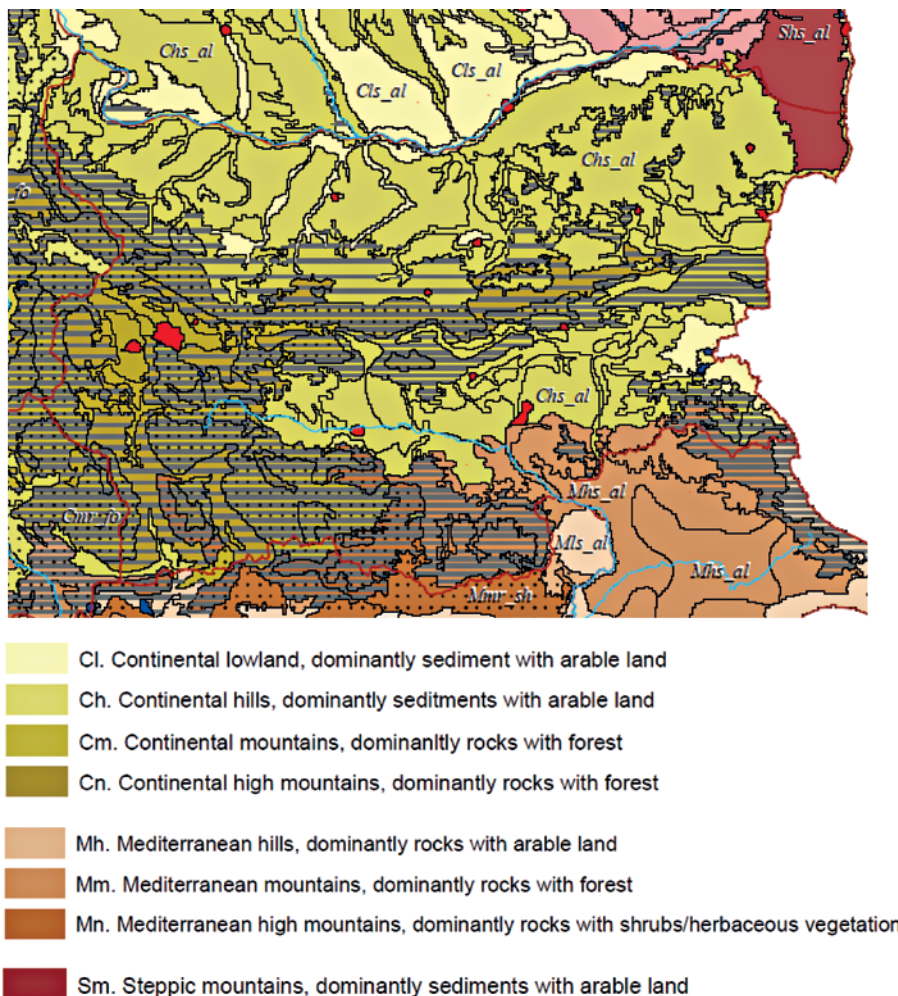


Figure 7: The LANMAP2 Image for Bulgaria

Bulgaria has a structure dominated by two major eastwards flowing valleys divided by a range of mountains and with another range to the southwest. These are also quite forested but represent the main areas for pastoral landscapes. The area is right on the divide between the continental climate and the Mediterranean climate.

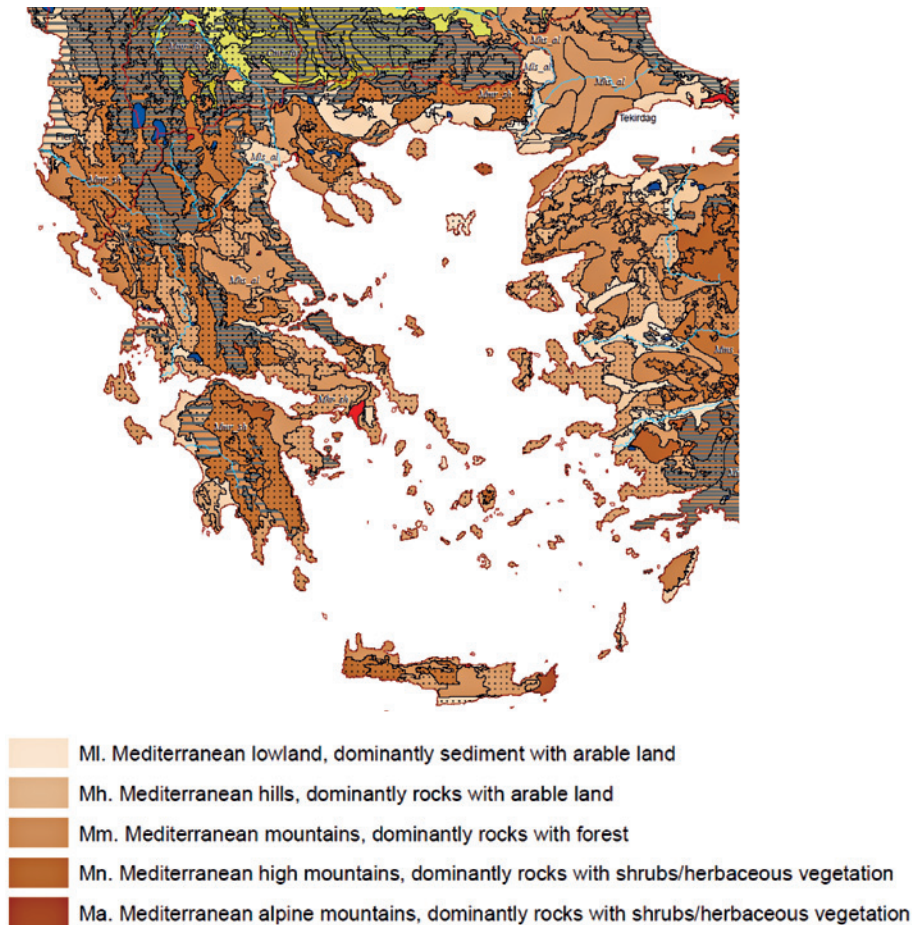


Figure 8: The LANMAP2 Image for Greece

Greece is the only CANEPAL example which is truly Mediterranean in character and also very mountainous and with a limited amounts of true forest but a lot of low Mediterranean scrub which has been significantly altered over the millenia by human activity such as goat herding and fire.

This brief overview provides the basic conditions for the development of pastoral agriculture in these example countries – the landform type and the climate

being key determinants which influence soil development and the potential for arable agriculture. Clearly, in general it is the countries with more rugged topography, more extreme climates and poor soils which are best suited to sheep. Thus the dry or wet heaths of upland Britain, the higher hills and mountains of France and higher hills of Poland, the mountains of Bulgaria and Greece and the drier rocky islands of Greece. Only in Hungary and Estonia is it difficult to identify specific major landscape divisions based on landform and climate where sheep are more suited than other forms of agriculture.

Cultural and pastoral overlays

Overlaying the natural aspects giving the classification of the landscape (which however relate to both the cultural and ecological aspects of the definition and understanding of landscape) are the patterns of human use that has taken place in response to the opportunities and constraints of climate, landform and associated soils and natural or semi-natural vegetation. Central to this is the effect on ecosystem processes by grazing which can assist forest clearance by removing all regeneration so that trees eventually die out but are not replaced and then maintain this open character. The degree to which this takes place depends on the grazing pressure – if this is low then sheep or goats and forests or scrub can coexist while if too high can result in a lack of vegetation and loss of what soil there is – together with human activities such as fire (sometimes used to maintain low shrubby vegetation or to remove dead and valueless grass) and haymaking.

There may also be an interface between completely pastoral landscapes and mixed partly cultivated landscapes, often occupying lower elevations and better soils and the source of hay for winter fodder as well as being the location for the farmsteads of the farmers or shepherds. This interface may be close by and direct or, in the case of transhumance landscapes, indirect and a distance away from the pastoral area. Such areas may be considered to be part of the pastoral landscape but are usually not solely associated with sheep farming.

From the analyses of sheep farming landscapes prepared as part of the country reports for CANEPAL it can be seen that there are several major categories of effect of pastoral management activity which can be translated into some effects on landscape character.

These are:

- Free roaming unenclosed: Sheep are allowed to graze freely over unenclosed areas without being accompanied by shepherds; they know their territory (they are “hefted”)
 - ♦ They live out all year round except for limited periods, e.g. during lambing
 - ♦ They are brought down to the farm in winter and live in enclosed fields
- Shepherded: Sheep graze open unenclosed pastures but are accompanied by shepherds to guide and protect them, possibly brought there through transhumance.
 - ♦ They are out on the pasture all year round except for specific times, e.g. lambing
 - ♦ They are brought in overnight and taken from the area in winter
- Free roaming enclosed: Sheep live in enclosed fields of various sizes or other limited areas, e.g. Islands, where they are unable to wander freely

In addition to the management systems there are also the vegetation types which vary, mainly being grasslands, shrublands and open forest. These assume different degrees of importance in different countries.

2. CULTURAL LANDSCAPES

2.1 Characteristics of sheep-grazed landscapes by countries

In relation to the three main types of pastoral landscapes described above, management practices are or can be adjusted to reduce or prevent damage by overgrazing etc. For example, in a free roaming enclosed pastoral landscape, the farmer may improve productivity by improving the quality of the grass (fertilization, introduction of new varieties by seeding or planting and weed control), increasing vegetative cover and forage supply to the animals, especially in sensitive areas such as Greece. In a shepherded landscape, also such as that of Greece, grazing during the summer months when pasture growth is limited or has dried out, can be used to control vegetation to reduce the risk of wildfires. However, where there is uncontrolled grazing sheep and goat grazing, negative impacts may occur to vegetation cover, through trampling or damage to trees in rejuvenated forests. In certain landscapes such as Mediterranean mountains, the nomadic pastoralism associated strongly with the transhumance landscape shows that this is the only way of managing sheep and forests together.

The following table summarises the main pastoral types across Europe according to the CANEPAL countries:

Table 1: Summary of pastoral landscape types in the CANEPAL example countries

	UK	France	Poland	Estonia	Hungary	Bulgaria	Greece
Mountains	The mountains are not as high as on the continent but they are rugged and exposed. Examples are in the Highlands of Scotland, the Lake District and North Wales, all being popular for sheep grazing	The Pyrenees, the Massif Central and the Alps form the main ranges used for sheep grazing, together with some areas on Corsica	The High Tatras dominate in the far south while the Bieszczady and Pielniń form a larger part of the Carpathian range. The Sudety mountains are to the west bordering Czech Republic	None	None	Two ranges of mountains, the Stara Planina, which runs across the centre of the country and the Balkan ranges comprising the Rhodopes, Rila, Pirin and Vitoshas are dominant areas for sheep breeding	Much of the country is mountainous and so are some of the larger islands such as Crete
Hills	There are many high and low hills, especially in the Pennines running through the centre of England, the South west of England, the Scottish borders, Wales and Northern Ireland	The hills of the outer part of the Massif Central are extensive and the foothills of the Pyrenees and Alps are also important as the transhumance routes pass through them	Parts of the Bieszczady and Pielniń ranges are more hilly than mountainous	The southern hills of the Karula area are used for sheep nowadays	The areas surrounding the Great Hungarian Plain are low hills	There are substantial hilly regions between the mountain areas but these are not so used for sheep grazing	Many of the islands are hilly and there are foothills which lead from the mountains down to the sea
Plains	Some poor areas and sires such as lowland heaths and commons, salt marshes and poor soils where sheep are suited are used	Flatter areas provide the winter pastures from which the sheep are driven or transported to the mountains. These are in regions surrounding the mountains but some distance away.	Sheep are found in the plains in the north and west of the country around Bydgoszcz and Poznan and in the east around Lublin and Białystok	Plains are usually arable land if not wet or forest so sheep are only found on special areas of unique vegetation not suitable for arable.	The Great Hungarian Plain dominates the centre and east of the country and used to be very significant for sheep grazing	Poor quality land unsuited for arable production is used for sheep grazing, distributed across the country.	Epirus, Macedonia, Thrace and Thessaly are the areas of continental Greece which possess plains used for sheep production to some extent although they are more suited to arable production
Islands	Scottish islands may be rugged but are affected by salt and wind so often possess special characteristics as well as the coastal areas	Corsica is a hilly/mountainous island with special characteristics and is used for sheep production	No islands	Sheep are found on several islands and use the habitats specific to the island character	No Islands	No Islands	Greece has a mass of large and small islands of different landform. Some have special character for sheep production
Landform							

Pasture vegetation										
	Grass	The western mountains and lower hills are dominated by grasses which grow on the wetter soils.	Most of the mountain pastures are grass dominated	Grass is the main cover in the south of Estonia while the coastal grazing areas and alvars are grassy	Grasses dominate the sheep raising areas since Hungary is a lowland country	Grasses are dominant in the mountain areas	Greece can be found in most areas as part of a mix with other vegetation types.			
	Shrub land	In many higher mountains and especially in the eastern hills and moors low or dwarf shrubs dominate and are grazed, especially Calluna vulgaris and Vaccinium myrtillus	Some small portion of the more Mediterranean type landscapes are dwarf shrubs	Shrub lands are found on alvars and the sheep eat or nibble these although the main grazing is grass growing there too.	Shrubby areas occur on the hills in places where sheep also graze because the pasture is of lower nutrient status.	Shrubby areas are found in the Balkan mountains in addition to grasses.	Mediterranean shrub lands are found in mountains, hills and plains. They are a common land cover type in Greece and replaced the forest centuries ago. They are also browsed by goats which are an important animal in addition to sheep.			
Open forest or wood pasture	Wood pasture used to found on low-land commons and now is quite rare. Sheep as well as other farm animals grazed them. They are an especially important habitat type.	Open forests are found in the mountains and the sheep use these as they form part of a mosaic of vegetation along with the mountains grassy pastures.	Wooded pastures were once common and are now fairly rare and form specially valuable landscapes, usually in a mosaic with other types	Remnant wood pastures in association with sweet chestnut trees can still be found in the hilly areas to the north and west although they are less grazed than previously	Wood pastures in the Rhodope mountains are a traditional landscape type maintained by sheep grazing.	Open forests are found in all landscape zones in Greece and form valuable pasture lands.				

		UK	France	Poland	Estonia	Hungary	Bulgaria	Greece
Pastoral management type	Free roaming unenclosed	The most common management type in the UK uplands where most sheep live. The flocks are "hefted" so they know their territory and do not need to be shepherded	Not used	Not used	The sheep on the coastal meadows and alvars are free roaming	Not used	Not used	Not used
	Shepherded	Not used	The main way of management on the mountains in summer. Also necessary because the sheep are milked	The main way up in the mountains in summer. Also necessary because the sheep are milked	Not used	Used in the open landscapes	The most common method of management in the hills and mountains	The main way of managing sheep as they need to be milked
	Free roaming enclosed	Sheep live in fields in lowlands, sometimes in larger ones where a section of moorland may be fenced or walled off from another section of moorland.	In the lowlands the sheep are held in enclosed pastures over the winter.	In winter the sheep are kept in fields in the lowlands	Common in most areas, where the fields or semi-natural habitats are enclosed by fences.	Common in areas where the open landscapes have been enclosed for more intensive crop production	The sheep are overwintered in fields close to farmsteads	Common in areas where sheep are used to graze grass beneath olive or fruit trees or among vines as well as in lower enclosed pastures over the winter

Table 1 shows that there is a lot of landscape diversity and that the different countries represent predominant types. Some of these types are more generic, such as shepherded flocks on grassy mountain pastures which are found in several countries such as France, Poland, Bulgaria and Greece (and other non-CANEPAL countries such as Spain, Switzerland, Italy, Austria and FYR Macedonia) while the free roaming flocks on open dwarf shrub mountains and hills are less common to the UK (and could also be found in other non-CANEPAL countries such as Iceland, Ireland and Norway). Sheep living in enclosed pastures in hilly or lowland landscapes for all or part of their lives is another common type, often within a mosaic of mixed agriculture such as hay meadows, arable, viticulture, olive groves or cattle raising, where the sheep overwinter or have their lambs, for example. Table two summarises the main characteristics of the pastoral landscapes of each CANEPAL country.

In addition to the landscape as formed by grazing and associated management activities such as burning as practiced in several countries, such as the UK where heather (*Calluna vulgaris*) moors are burnt to rejuvenate the dwarf shrubs, other cultural aspects help to give the landscapes their distinctive character. The first of these is the range of ancillary elements constructed by farmers and shepherds to support their activities; the second is the breed of sheep which is often closely associated with a specific area and landscape.

Table 2: Summary of main pastoral landscape characteristics of each CANEPAL country

Country	Summary of characteristics
UK	Sheep mainly free roaming on open grassy or dwarf shrub mountain and hill landscapes, brought down to enclosed pastures for mating, lambing, shearing, weaning and other activities but otherwise spending their time out in the open. Some sheep living on lowland grassy or dwarf shrub common lands (minor type).
France	Sheep spending their summers up on mountain and hill mainly grassy (with some shrubby or open forest pastures) tended by shepherds. Sheep moved some distances from farms to mountains by traditional means – driving them on foot – or by motorised transport and back again for overwintering in lowland fields.
Poland	Sheep spending their summers on mountain and hilly grassy and open forest pastures tended by shepherds, moved by motorised transport from lower areas nearby where they overwinter.
Estonia	Sheep are kept in some kind of enclosed grassy or open forest pasture in hilly or lowland areas or on islands. They live there all year round.
Hungary	Sheep are kept in hilly and plain areas on grassy and some shrubby or wood pastures, either shepherded on the open hills and plains or in enclosed fields.
Bulgaria	Sheep spend the summers in the hills and mountains on grassy and wood pastures tended by shepherds and then they overwinter in pastures down on the plains or in the foothills.
Greece	Sheep are found in a wide range of mountain, hill and plain landscapes and on islands on grassy, Mediterranean shrub and forest pastures. They are taken up to the mountains in summer and live in lower areas in fields and (occasionally) among vines and olive groves in the winter.

2.2 Ancillary sheep farming structures and their effect on landscape

Shepherds in mountain areas who tend the summer grazing in France, Poland, Hungary, Bulgaria and Greece have a long tradition of building temporary or permanent huts and animal shelters as well as buildings for milking or making cheeses, which is an important activity in these areas. In the UK where sheep roam freely and are raised for meat there is a lesser need for structures although field walls, sheep folds and pens for tending them can be found on the open mountains and moors. The enclosed areas such as fields on lower slopes and plains in all countries usually need enclosing elements such as fences, walls or hedges and there may also be hay barns and sheds for sheltering the animals. Normally these have traditionally been constructed from local materials such as stone, wood, reeds and grasses although some recent examples using recycled bits and pieces of tin and plastic have also started to appear.

The style of construction of these elements is often very regionally specific and in some cases even modern examples use techniques from hundreds or even thousands of years ago, such as in the “bee-hive” shelters still to be found in Greece. The geology of the area tends to determine the use of stone and if so what type and the presence or absence of forest of different species of trees determines the use of wood. Table 3 summarises the range of ancillary elements found in each country.

Table 3: Ancillary elements used in sheep husbandry in each CANEPAL country

Country	Elements
UK	Dry stone walls used to divide fields and to form a boundary to the open hill or mountains; drystone built sheep folds; stone built hay barns with stone or slate roofs; dipping pens; lambing shelters; hedges made from different woody plants “laid” to make them more animal proof.
France	Stone huts in the mountains; drystone walls along the sides of transhumance tracks; stone sheep folds.
Poland	Wooden huts of log or plank construction for processing cheese, with smoking fireplaces and cheese storage; wooden fences to hold the flock during milking and other activities; hay storage barns; hay cock supports.
Estonia	A wide range of types of fences made of wood in different forms; drystone walls, usually with a wooden railing on top; hay barns made from logs, planks, limestone slabs (in areas with access to stone) roofed with thatch of wooden shingles; wooden animal shelters (log, plank and thatch or shingle roofs); hay cock supports, feeding racks.
Hungary	Simple unroofed enclosures in rectangular form made of wood, hurdles or reeds as milking folds or to shelter sheep overnight; simple shepherds’ huts made of A-frame construction in wood or reeds and easily moved.
Bulgaria	Shepherd huts made of stone and tiles or wood; fences of wood; watering points where ponds or springs have been enclosed; access tracks; trees used for fodder by pollarding such as mulberry; trees used as racks for storing hay out of reach of animals.
Greece	Beehive huts made of natural stone; grass huts of nomadic shepherds; drystone walls to enclose grazing areas; stone cobbled mountain paths, temporary shelters made of wood and other materials; enclosures for sheep made from modern second hand materials.

2.3 Local sheep breeds and landscape

In many areas the breeds of sheep are very localised and developed to fit into the landscape as well as to produce milk, wool, meat or a combination – the need for being hardy in mountain landscapes meant that a thick fleece was needed for example. Breeding to combine the necessary characteristics has created a wide variety of types. Table 4 summarises these.

Table 4: sheep breeds related to landscape types in the CANEPAL countries

Country	Sheep breeds and their features
UK	Hardy horned or polled black or white faced sheep in the uplands such as the Herdwick in the Lake district, the Swaledale in Yorkshire, the Scottish Blackface in the Borders and Highlands, the Welsh Mountain all over Wales are all suited to meat and wool production and live outdoors all year round. They have thick, dense fleeces of coarse wool and they thrive on poor quality pasture including dwarf shrubs and coarse grasses. Lowland sheep also exist which are bigger, produce finer wool but are not so hardy – such as the Suffolk, Border Leicester, South Down or Romney Marsh but these live in enclosed fields as part of mixed farming systems.
France	In the northern half of France, sheep are large and breed well but live in lowland areas in fields so do not need to be so hardy such as the the Berri-chon and Ile de France the Paris basin, the Charmoise between the Loire and the Dordogne, the Mouton Vendéen in the west, the Mouton Charollais in Burgundy and in the Auvergne. Elsewhere the breeds are adapted to the mountainous regions, such as the Manech and Basco-Béarnais in the Pyrenees, the Mérinos Mourérous and Préalpes in the Alps or the Lacaune and Causses du Lot in the Massif Central.
Poland	The Polish Merino, the Polish Lowland and the Polish Longwool breeds are kept in the plains on intensive farms in the north, west and east where wool production was the target. The upland and mountains areas of the Carpathians (Podhale region especially) are the home of the hardy and well-adapted Polish Mountain Sheep which originates from the old Cakiel breed native to the area, this being used for milk and meat with sheepskin and some woollen products being by products. There is also a small population of Polish Heath Sheep, an old and rare breed used on the wood pastures and heaths of the north and good for conservation purposes.
Estonia	The white Estonian native sheep was used as the basis for the development in the 1920s of the Estonian White-headed and Estonian Dark-headed breeds which are the main ones in use today and are suited to the climate while also producing meat and wool. The Ruhnu sheep is a native breed living on the islands of Estonia and is a much older type and very hardy.
Hungary	There are distinctive looking breeds in Hungary such as the multi-purpose (meat, milk, wool) Racka, the mainly meat but also wool producing Citka which is more of a mountain breed but the most common breed of all is the Hungarian Merino which is most productive and suited to more intensive farming.

Country	Sheep breeds and their features
Bulgaria	The North-east Bulgarian Merino is numerically the most important breed used in intensive forms of production together with the Askanian Merino, both wool and meat breeds, and the Pleven Blackhead, Patch-faced Maritza, White Maritza and Stara Zagora which are lowland milk producing breeds. In the mountains the characteristic and native breed associated with migrating shepherds is the Karakachan and in areas bordering Serbia the Zackel.
Greece	Being a diverse and island-dominated country Greece has many breeds with very local associations, such as the Karagouniko which is found in the plains of Thessaly, the Kalarritiko in the Tzoumerka mountains–Plains of Thessaly, the Orino in the Mountains of Epirus and West Macedonia, the Peliou in Magnesia and the Pilio mountains, the Kefallenias in Kefallonia, the Kymi in Euboia, the Sfakia and Anogeiano in Crete. The Vlach breed originated in the Pindus Mountains. The Sarakatsan (also known as the Karakachan or Karatsaniko) is found mainly in Macedonia and Thrace, and in the mountainous parts of Bulgaria. The Drama Native breed, encountered near the village of Volax, north of Drama is quite a unique one. The Florina is a local breed from north-western Macedonia. The Karagouniko is found in the Palamas-Trikkala area of Thessaly, and, also in the Macedonian plains and in Boeotia. These are all milk-producing breeds with meat and wool as by products.

So, summing all of the above pictures together an idea of the variety of pastoral landscapes can be obtained. Since landscape as a concept is both visual and ecological, it is necessary to look at some representative examples from each country and to see how the landscapes appear and to describe their visual characteristics.

3. EXAMPLES OF LANDSCAPES OF SHEEP HUSBANDRY FROM AROUND EUROPE

3.1 UK

Yorkshire Dales

This area in the north Pennines of England is a National Park and is famous for the patterns of stone walls running up the hillsides. The area can be divided into two main zones – the area dominated by



A typical view in the Yorkshire dales, with fields surrounded by walls, grassy fells, solitary stone barns and lots of Swaledale sheep. Source: Gemma Bell

magnesian limestone where the houses and walls are light grey in colour and the hills are covered in grassy vegetation and the area of sandstone geology where the walls and buildings are darker grey/brown and the vegetation is dominated by heather. The glaciated valleys are typically U-shaped with more fertile valley bottoms, fields climbing up the slopes divided by stone walls and then the open moorland, sometimes with some walls dividing them into large sections. There may be hedges in the valley bottoms before the walls start higher up. The heather areas are usually burned in strips for grouse management which also occurs on the same areas. Bracken spread is a problem in some areas. It used to be cut for bedding which reduced its vigour but no longer.

The sheep breeds used in this area include the Swaledale and the Wenslydale, with the former being the more common. Both are named after valleys in the area (dale is an old Norse word for a valley). The Swaledale is very hardy and lives out all the time.

The walls are the most characteristic feature of the landscape, climbing up from the valleys in extensive grid-like patterns. These were mainly built in the 19th century and show a prodigious amount of labour in their construction. Interspersed with the fields are small barns built into the slopes and roofed with stone. These were used to hold the hay made from the adjacent fields. Some have fallen into disrepair and the walls also need regular maintenance so that skill in the construction of dry-stone structures is needed and this is becoming rare.

Lake District

The Lake District lies on a heavily glaciated rugged geology of metamorphic and igneous rocks with a very mountainous character. The landscape structure is complex, heavily glaciated and of course has many lakes. The climate is much wetter in the west of the country which affects the vegetation. The hills are dominated by grasses rather than heather and this gives them a green hue interspersed by grey rock outcrops, bracken and patches of woodland giving the area a coarse texture and a lot of diversity.



A scene in the Lake District with a glaciated valley and rugged mountains or fells. Source: Gemma Bell

One unique aspect of the area is the sheep breed, the Herwick, which can be dated back to Viking times and it has a special appearance and somehow fits into the landscape.

Drystone walls and stone farm buildings are also of the natural dark grey rock and the walls climb over the mountains. Twisting narrow lanes wind their way through the landscape. The fields are greener and lined with trees in the valley bottoms where soils are somewhat more fertile. These are used for hay and for lambing.

Scottish borders

This area is the extensive upland zone to the north of the English border and is contiguous with the Border Hills in England. The geology consists of hard Silurian and Ordovician sedimentary rocks which, after erosion, form rounded, smooth and rolling hills with more sculpted areas on higher summits. Vegetation is dominated by heather moor and rough acid grassland and the climate is harsh wet and cool. The broad valleys have better soils so tend to have with arable land and improved grassland and substantial stone farmsteads.

The sheep here are the Scottish Blackface, a horned type which is very hardy and lives out on the open exposed, windswept moors.

A feature of the Borders landscape is the presence of conifer shelterbelts planted to give shelter to stock on the exposed hillsides. Walls (drystone dykes) are also found in the landscape.

A view of the Border hills across a broader valley of arable and pasture land, with shelterbelts on the slopes rising to open moorlands. Source: Simon Bell



Western Isles

These islands are the home of the main crofting areas and also where Harris tweed is made, so that the landscape has a strong relationship with sheep. The landscape has a bleak open and often low landform dominated by large-scale expanses of blanket peat moorland also cut for fuel. There are few if any trees. The rugged coastal landscapes have cliffs and beaches of silver sand interspersed with grassy “machair” vegetation which is of great conservation value and is grazed. Some areas have more rugged hills or mountains. Access is by narrow single track roads following the coastline.

The sheep breed here is also the Scottish Blackface whose wool is used to make the special tweed cloth which is a unique product here.

Human elements include small fields enclosed by wire fences along the coastal strips and scattered cottages and new houses spread across the landscape of the fields. This type of landscape has a unique character and results from the specific land tenure system of crofting.



A scene of a typical crofting landscape showing the open character with scattered houses and very small fields.
Source: Simon Bell

Snowdonia

Snowdonia is the area of highest mountains, deep glaciated valleys, slate mines and spectacular scenery in Wales. There are no deer in Wales so that the sheep have the mountains to themselves and Welsh mountain sheep are the breed suited to these areas. The area has metamorphic geology dominated by slate which gives a distinctive colour to the rock and to the traditional buildings. The landform is highly glaciated which produced jagged skylines and landforms with corrie lakes. More fertile valleys penetrate the mountains with hedged fields while upper fields may have slate fences. The vegetation tends to be grassy mountains with heather areas and green pastures

The sheep breed is the Welsh Mountain Sheep.

There are many small villages and former mining hamlets interspersed with farmsteads all of slate and sometimes whitewashed.



Rolling farmland in Snowdonia - fertile valleys penetrate the mountains.
Source: David Noton, www.davidnoton.com



Mountain pastures in the Ossau Valley in the Pyrenees, showing the wooded slopes and massive rugged peaks above. Source: Wikipedia open source

3.2 FRANCE

Pyrenees

The Pyrenees are high mountains and the landform has arisen as a result of the geology. The eastern part of the Pyrenees consists largely of granite and gneiss rocks, while in the western part the granite peaks are flanked by layers of limestone. The massive and unworn character of the chain comes from its abundance of granite, which is particularly resistant to erosion, as well as weak glacial development. The landforms are therefore dramatic, with many cirques (bowl-shaped valleys) and numerous waterfalls. The climate is wetter in the west and drier in the east so that there is more forest in the west and more grassland pasture in the east, although sheep grazing is found everywhere.

The sheep breeds of the Manech and Basco-Béarnais are pastured there.

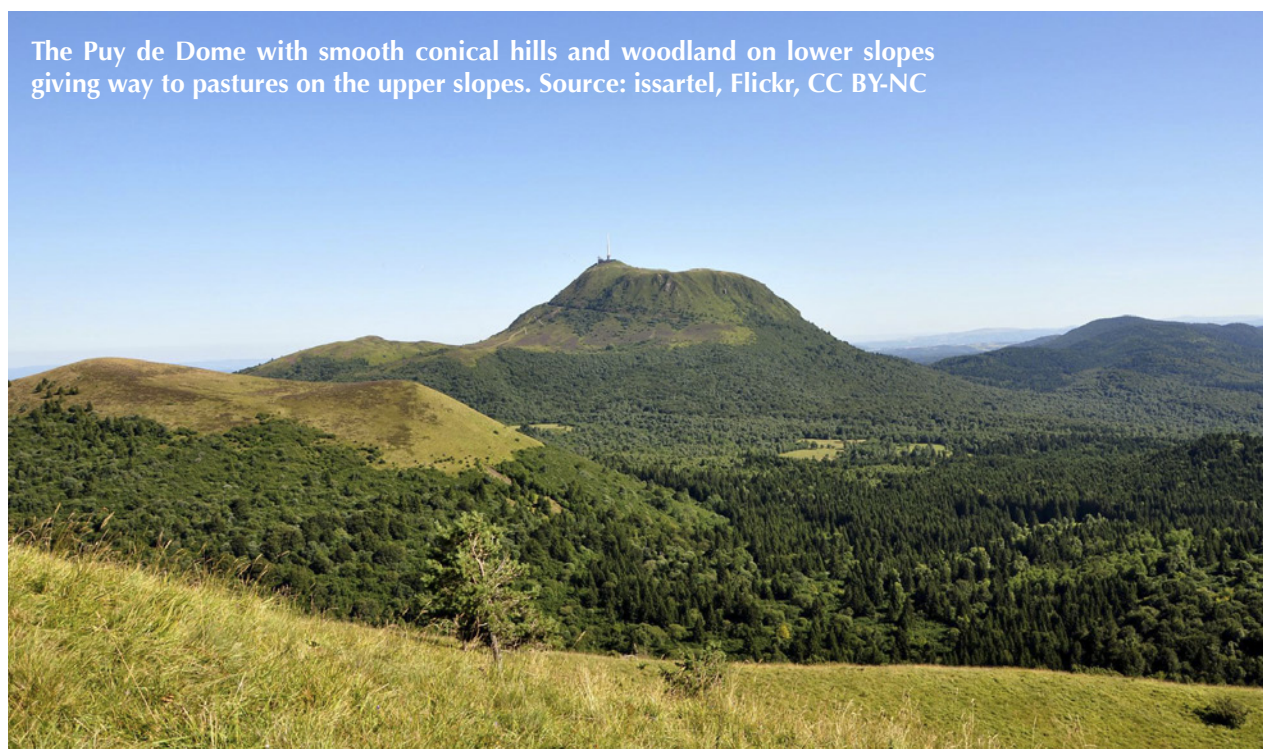
The landscape also has scattered farmsteads in the valleys and, in the mountain pastures, stone-built huts, shelters and sheep folds.

Massif Central

This area is a very complex area of many ancient geological structures dominated by the latest quite recent vulcanism. The landform ranges from rugged metamorphic areas to smooth slopes of conical volcanic peaks. There are the remains of ancient mountains and crustal sections. Vegetation includes forested areas, grasslands on volcanic and karstic soils and sheep are to be found in many different areas.

The sheep breeds here include the Lacaune and Causses du Lot, named after the areas where they are bred.

The landscape also has many farmsteads, stone walls and other elements constructed from local materials and the valleys are rich in villages.





Sheep grazing at Lac de la Muzellé, French Alps. Source: M. Redcheex, Flickr, CC BY-NC



The landscape of Tatras in Podhale. Source: Hejma, Flickr, CC BY-NC

Alps

The Alps a high mountain chains produced by upthrust, folding and faulting of limestone into the range we see today, subsequently heavily glaciated to form the rugged, steep and diverse set of landforms, erosional at higher elevations and depositional at lower ones, with typical U-shaped valleys and ribbon lakes, cirques and steep faces. The pastures lie on the upper areas above the forests, in an area once treeline and now modified by centuries of grazing by sheep. The highest peaks rise above these areas to dominate the landscape. The valley floors are occupied by settlement, agriculture and transport infrastructure and the sheep are taken up to the mountains in summer, so these are transhumance landscapes.

The sheep breeds are the Mérimos Mourérous and Préalpes.

The landscape also contains shepherds huts and folds made of local stone together with tracks used for driving the sheep up and down the mountains.

3.3 POLAND

High Tatra Mountains

The Tatra Mountains are composed of a core of granitoid rocks made from solidified magma and metamorphic rocks such as gneiss with, to the north and into Poland, sedimentary rocks such as sandstones and limestones forming the lower mountains and foothills. The core is very rugged and rough while the foothills are more rounded and smooth. They are heavily forested and form a national park where sheep grazing must follow traditional husbandry practices as it is also part of the cultural heritage of the Tatras. The grazing lands were originally in alpine pastures lying above the forest line and also on the slopes of the lower areas in the Podhale area to the north of the central range. These grazings are among stands of forest so that they form part of a mosaic landscape. The advent of the national park reduced the grazing in the higher areas so it is nowadays more concentrated on the lower hill areas.

The sheep breed here is the native Polish Mountain Sheep.

Many wooden structures are found in the areas – huts for milking and cheese making, fenced enclosures, wooden hay barns and hay cock supports.

Bieszczady Mountains

These are a range of low mountains which lies in the south east of Poland and form the Eastern part of the Carpathian Mountains. The geology is mixed, with granite, gneiss and some limestone among other rocks and of course they are glaciated but not as rugged and dramatic as the Tatras. The rounded, rolling hills with some more rocky exposed summits and deep valleys are partly forested and partly open, with linear patches of woodland running up and down the slopes. The grassy hills which often run over the summits of the ridges are ideal for sheep which are shepherded in the summer. Some of the area was depopulated after the Second World War and the forest has returned, making the landscape more wooded than formerly.

The Polish Mountain Sheep is the main type breed here.

The shepherds build wooden huts for sleeping in and for producing cheese from the sheep, which are used mainly for milk production. The area is a national park.



A scene in the Bieszczady Mountains with the extensive pasture lands and the hills rising in the background. Source: Mariusz Cieszewski, www.fotocom.biz



High bare cliffs and picturesque green pastures of Pieniny mountains. Source: Hejma, Flickr, CC BY-NC

Pieniny Mountains

These mountains are also along Poland's southern border but are mainly composed of limestone which takes the form of many high bare cliffs, especially around the Dunajec River. Above the cliffs and the forests that clothe the rest of the valley sides the pastures can be found. The forest tends to remain in the deep steep sided smaller valleys which penetrate into the plateau summits. Sheep are pastured on these areas in the summer, transported up from lower areas and used for milk and cheese production.

The sheep are the Polish Mountain Sheep as used elsewhere in the mountain areas.

The shepherds construct timber shelters and huts for cheese making, these lie dotted about the pastures.

3.4 ESTONIA

Saaremaa and the islands

The island landscapes, for example Saaremaa and Muhu present a combination of different vegetation lying over fairly flat limestone terrain which rose out of the sea after the ice age. Three main landscape types can be found here which are grazed by sheep used to manage these important habitats. These are alvars, coastal meadows and wood pastures. Alvars are also known as limestone pavements and present a limestone surface with crevices in which grow calcium-loving plants. These need to be grazed in order for them to remain open and they are a rare habitat type. In association with the alvars are coastal meadows found on the edges of the Baltic Sea, on shingle and sand, and also wood pastures where the natural forest has become open through long grazing and other management.

The sheep used to graze here are the Estonian White-headed and Dark-headed sheep as well as the native and very old type, the Ruhnu.

The farmers erect many fences out of wood as well as sheds, shelters and hay storage barns using timber and thatch.





A coastal meadow on an Estonian island. Source: A. Ader



The rolling, hilly, small-scale glacial landscape of Karula with sheep grazing in a fenced field. Source: Simon Bell

Estonian uplands: Karula

The Estonian uplands are the second area where sheep are kept. The landform is of rounded hills composed of glacial deposits such as moraines and drumlins in which large granite and other igneous or metamorphic boulders can be found, which often makes the fields very difficult to work. The landscape is a mosaic of pasture, meadow, wetlands, small lakes and lots of forest. The sheep are not large in number but are kept in enclosed fields and are not allowed to run free. The landscape is small-scale and intimate with views hidden by the forest. Winding lanes leading to wooden farmsteads spring surprises on the visitor.

The sheep may be the native Estonian breeds but may also be imported breeds used by some more entrepreneurial farmers. Given the plentiful supplies of timber from the forests and the only stone available being boulders, these materials are used in the construction of farmsteads, barns and shelters as well as fences and gates.

3.5 HUNGARY

Great Hungarian Plain

This is the large area of flat plain within the Carpathian ring called Pannonia. It is partly an ancient steppe which originated in the Pleistocene and partly large-scale river plains subject to seasonal flooding until the rivers, especially the Tisza, were controlled in the 19th century. While once completely open, the plain, which covers over 50% of Hungarian territory, has been enclosed, in the sense that it has been subdivided into many ownerships and land uses so some of its original extent and the areas used by herders of cattle and sheep has been reduced and replaced by more intensive breeds and arable agriculture. However, large areas still remain grazed by traditional means e.g. the so-called Puszta in Hortobagy and Kiskunság National Parks. The terrain is flat to rolling and fairly treeless, giving it a broad scale where the sky is a dominant feature of the scene.

The Racka is the characteristic historical breed found here, but most of the sheep raised today are merinos. The shepherds have made structures such as shelters and wells in their centres for looking after and milking the sheep.



Merino sheep grazing in the puszta on the Hortobagy area. Source: Ábel Molnar



Hungarian Merinos grazing on the Matra mountains Source: Ábel Molnar



Typical upland pasture in the Rhodopes. Source: Simon Bell

Hungarian uplands

This landscape lies to the north of lake Balaton and along the northern borders of the country and is characterised by low rolling forested hills with large patches of open pasture lands on the foot hills. Other lands in the intervening valleys are enclosed into large fields. The hill pastures may have scattered trees and patches of forest or scrub and are crossed by numerous tracks. The sheep graze these open areas as well as stubble or fallow lands.

The main sheep breed is the Hungarian merino. The landscape is also dotted with shelters, shepherd-ing enclosures and other small elements used by shepherds.

3.6 BULGARIA

Western Rhodopes Mountains

The landform here comprises rounded slanting hills smoothly unfolding in all directions. This is dissected by a dense network of torrents, streams and brooks. The area has a mild climate, with four distinct seasons characterised by a long but mild winter, influenced by the Mediterranean climate. The land cover comprises a mosaic of closed and semi-closed meadows and pastures surrounded by juniper and Scots pine forests. There are some areas of dystic soils, leading to the formation of many secondary grasslands with erosion. Century-old spruce forests grow at the highest altitudes, beech and pine trees occupy the lower parts of the mountains. In some places terraced slopes, used for agriculture in the past covered with shrubs and small groups deciduous trees. Grazing sheep are and the melody of their bells are a feature in the in the enclosed meadows.

The sheep breeds are the Merino types and also the Karakachan is found here.

Human impact on the landscape can be found in the scattered small villages and huts made of stone, terracotta tiles and wood. Wooden fences enclose arable land and large hay stacks stand out in the open over the winter.

The Central Balkan Mountain sub-region

The landform comprises ranges of moderately high mountains with rounded slopes. The vegetation is a mix of grassland shrubs and deciduous woods and wide open meadows. The deep shadow of the woods and individual trees during the hot summer is important for the sheep. The well drained but low productivity soils prevented the development of arable agriculture. Hay is sometimes stacked among the branches of trees in the form of stacks, groups of hay stacks in the farmsteads, cut branches of oak and beech trees and stacked foliage.

The sheep breeds are the merinos and the Karakchan. The shepherds' huts made of stone with tiles roofs are the main human features in the landscape.

South-eastern Balkans, Strandzha

Strandzha is a range of mountains on the Bulgarian-Turkish border. It has a special climate influenced by the Black and the Mediterranean Seas. It has high average annual temperatures). The landform comprises undulating rounded ridges, covered by thick green forests to an endless chain without steep summits or rocky peaks. There are two main river arteries - the Veleka and Rezvaya, with



A landscape in the Central Balkans with shepherds huts, conical haystacks and scrubby hills. Source: Marina Trayanova



Pastures among forest in Strandzha mountains – a great place to meet the “natives”. Source: mennohoutstra, Flickr, CC BY-NC

smaller rivers and some streams as feeders. Vegetation is an intriguing mix of European, Black Sea and Caucasian species, differing in origin, biological peculiarities and level of development. The areas are characterised by very low urbanization, small and depopulated villages. Villages with their pastures, meadows and little fields are sparsely scattered across the landscape. The area is also rich in traditions – preserved but threatened to disappear due to the lack of continuity.

The sheep are mainly the Merino.

Houses have a distinctive style, with a combination of stone and wood used in their construction. There are also shelters, barns and enclosures found in the sheep grazing areas.

3.7 GREECE

The Pindus Mountains

The Pindus mountain range runs in a NNW-SSE direction and separates the country into two parts with different climatic characteristics, especially rainfall amounts. It is roughly 160 km long, with a maximum elevation of 2637 m (Mount Smolikas). Because it runs along the border of Thessaly and Epirus, the Pindus range is often called the “spine of Greece”. The mountain range stretches from near the Greek-Albanian borders in Northern Epirus, entering the Epirus and Macedonia regions in northern Greece and reaching down to the north of the Peloponnese.

Lacking uniformity, the Pindus consists largely of a series of small ranges separated by transverse valleys eroded from limestone. The wide range in altitude results in two major forest zones: A conifer zone, with trees such as a subspecies of Austrian pine and the endemic Greek fir, characterizes the highest elevations, with juniper woodlands dominating near the timberline. A mixed broadleaf forest zone dominates the valleys and canyons of the middle and lower elevations.

The types of pastoral landscapes which are basically recognised are: 1. Mountainous Grasslands Free roaming, or Shepherded, or Transhumance, 2. Mountainous Open forests Free roaming, or Shepherded, or Transhumance.

The result is often wild, precipitous slopes that afford few passes. The area is heavily forested – the forest is increasing following land abandonment - with pasturelands set amongst these. Animal husbandry and the timber trade were the main occupations of the people. Transhumance landscapes were the most common ones. The animals kept were mainly sheep and goats (used for cheeses, meat and wool) with different transhumance practices. Some tribes were permanently located in their settlements or worked as shepherds for bigger herdsmen, others moved only their herds (and not their households and families) seasonally to the plains in the winter and returned in the autumn and others moved their households and families along with the herds seasonally to summer seasonal settlements. Today, the agricultural landscape is now replaced by forests, which are seen as more natural and desirable by urban populations.

The sheep used here are the Vlach, the Orino, the Sarakatsan, and the Florina.

Featured of human influence in the landscape include cobbled paths and arched bridges. Also, animal husbandry infrastructures, such as the one of nomadic Sarakatsan shepherds can still be found even if they are not used and are preserved as cultural relics.



A landscape in the Pindus mountains, the highest peak Smolikas. Source: Wikipedia



The Plain of Thessaly – arable land interspersed among shrubbery and pastures. Source: Ruben Holthuijsen, Flickr, CC BY-NC

Epirus, Macedonia, Thrace & Thessaly

The continental zone of northern Greece presents a variety of pastoral landscapes. The most dominant types of pastoral landscapes recognised are free roaming grasslands, shepherded grasslands, shepherded open forests and transhumance open forests. This zone of Greece is characterized by wide plains, where cereal cultivation has a long history, as well as broadleaves and coniferous forests. In the area of Macedonia and Thrace, the vegetation is particularly variable and fertile. Cereals and fruit trees are cultivated in the plains and coastal areas, scrubland and conifers in the lowlands (600–700m), Broadleaf oak forests in the mid-slopes (1000–1200m) and in the highlands there are conifers such as *Pinus nigra*, *Abies borisiiregis*, *Pinus sylvestris*, etc. In Thessaly during Ottoman times, the development of mountain animal husbandry was closely linked with cereal cultivation on the plains.

The sheep breeds such as the Karagouniko, the Drama Native, the Florina, the Piliou, are bred here.

Today, the pastoral landscapes are characterised by big farm units, very modernised in order to adjust to recent needs of the European market. However, older productions and management systems are being re-evaluated and a growing number of farmers seek to diversify their land uses once again. However, many small temporary constructions made of tin or other recycled material can be seen, which look completely strange in the surrounding landscape.

Ionian islands

The Ionian Islands are a group of islands in Greece and are traditionally called the Heptanes'e, i.e. "the Seven Islands", but the group includes many smaller islands as well as the seven principal ones. The six northern islands are off the west coast of Greece, in the Ionian Sea. The seventh island, Kythira, is off the southern tip of the Peloponnese, the southern part of the Greek mainland. Kythira is not part of the region of the Ionian Islands, as it is included in the region of Attica.

The pastoral landscapes of the Ionian Islands bare many similar landscape features distinctive of the south-eastern part of Greece. Because of the high amount of rainfall they receive, the vegetation is lasher than on the other islands. The pastoral landscapes are mainly free roaming grasslands or shrublands and shepherded shrublands. However, due to tourism growth, animal husbandry and pastoralism are no longer the first economic priority of the islands.

The sheep used here are many local breed such as the Kefallenias in Kefallonia.

Stereia, Evia and Peloponnesus

The south-eastern part of Greece – Stereia, Evia, Peloponnesus, presents a remarkable pastoral landscape of types associated with the free roaming and shepherded flock management. Due to the rugged mountain landform of limestone, giving altitude variation and local climatic differences, there is also much vegetation diversity (from broadleaves to olive groves and scrubland). Most of these pastoral landscapes are found in enclosed grazing lands or orchards. There have been goat and sheep grazing in these areas for thousands of years with deforestation, overgrazing and problems of soil loss still affecting the possibilities for agriculture.

The sheep breeds used here are not necessarily local ones as cheese production using breeds with improved milk yields are used extensively. The local sheep breeds are the Argous, the Agriniou, and the Kimi.



A landscape in Lefkada, Ithaca, showing the hilly terrain dominated by shrublands. Source: A. Kgoltsiou



A landscape in Peloponnesus with a village in the valley, terraced fields, scrub and sheep pastures in a mosaic among the rugged hills. Source: Simon Bell

There is a variety of old and modern installations (from cheap tin constructions to well organised small dairy units) to be found.

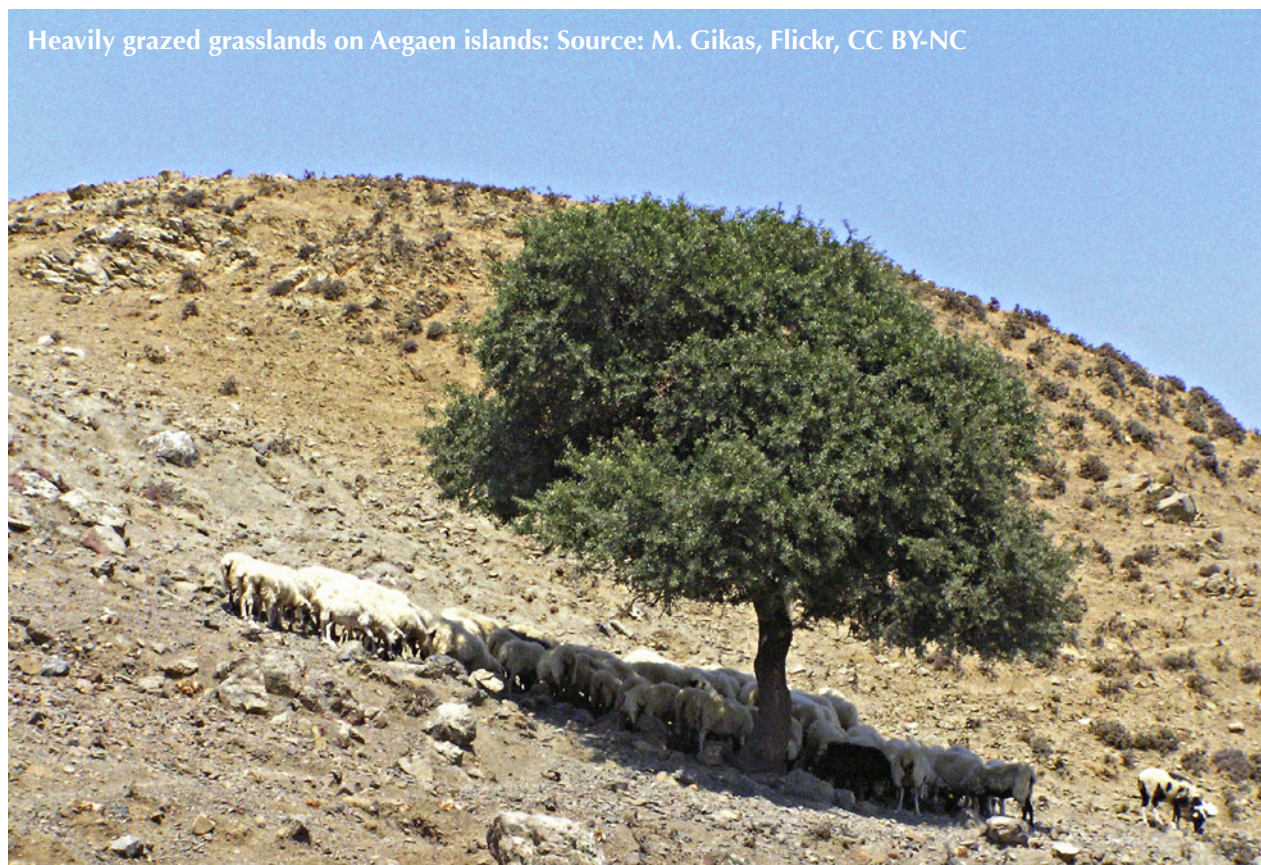
The Aegean islands

The Aegean islands, despite their diversity, owing to their particular geographical features, climatic conditions and their socio-economic structure, are characterised by certain disadvantages regarding agricultural activity and production, particularly in livestock. Given that their agricultural land is found on semi- or marginal areas, the islands have experienced a gradual abandonment of land and, therefore, a declination of local societies. Depending on the typology of each island, the most important characteristics are dry and steeply mountainous areas, an ecologically fragile environment due to the dry climate and overgrazing in the past leading to deforestation, forest fires and soil erosion. Also, scarcity and exhaustive use of natural resources, water shortage, landscape degradation and pollution, isolation from the mainland and remoteness, are some of their characteristics.

Sheep farming, while one of the main land uses, is less important economically as the tourism industry takes over. The pastoral farming types include free roaming and shepherded grasslands and free-roaming and shepherded shrublands. In some places such as Crete the increase in numbers of goats as a result of subsidies has caused an increase in the areas of sparse scrubland, almost becoming semi-desert in some areas.

The sheep breeds on the islands include the Sfakia, Anogeiano and Sitia in Crete, the Mytilene in Mytilene, the Chiou in Chios, Skopelos in Sporadic islands, Ikaria in Ikaria.

Many shepherding structures have been constructed in the islands using the local limestone – shelters, huts, walls to divide grazing areas etc.



4. ECOLOGICAL ASPECTS OF SHEEP HUSBANDRY

Sheep grazing (and goat grazing and browsing) has profound effects on the vegetation which carried many ecological consequences. The balance between positive and negative effects varies from place to place and depends on the intensity of the grazing or browsing pressure. In some countries and locations sheep are important for maintaining certain habitats; alvars on Saaremaa in Estonia, heather moors in England and mountain grasslands in the Tatras in Poland, for example. In other places overgrazing has created very serious problems – preventing the regeneration of some important ancient woodlands in steep valleys in the Pennines in England or causing soil erosion and desertification in Greece on both mainland and islands.

Changes in landscape character types related to sheep farming and grazing

Sheep farming and grazing has caused many impacts on landscapes in different areas – not only the Mediterranean, although they are more often severe here than elsewhere due to a number of factors. The most serious ones are:

1. Overgrazing which removes the vegetative cover and exposes the soil to erosion, resulting in desertification and completely denuded grasslands. As animals graze, they remove parts or whole plants from a particular grazing land. In the meantime, as animals move around they trample the soil with their hooves exerting a high pressure. This pressure results in soil compaction and, as a result, in the reduction of its infiltration capacity. Consequently, the rainwater runs off instead of percolating into the soil profile. In steep areas, which are common in the Mediterranean pastoral landscapes, the water runoff leads to soil erosion, first sheet but later rill and finally gully erosion. Eventually, the parent rock is exposed and desert-like conditions are created.

Overgrazing is very common, resulting in high erosion rates and disappearance of some plant species and expansion of other species unpalatable to animals. Furthermore, pastures in the upper zone can receive large numbers of animals during the summer period, or alternatively these pastures are undergrazed due to lack of infrastructure (roads and drinking water for the animals). Nowadays, however, goats are considered important animals not only for utilizing poor quality vegetation but also for controlling the woody understorey of Mediterranean forests and reducing the fire hazard.

As a result many young or valuable ecosystems disappear and turn to dry shrublands. Similarly, lot of shrublands with a variety of species, turn to desertified lands (example the Aegean islands)

2. Undergrazing can also cause desertification in the Mediterranean, because the plant material not removed by the animals becomes a very flammable fuel to be burned by wildfires, which in turn often lead to soil erosion. If not burned, undergrazed lands will be invaded by woody species, thus resulting in a loss of biodiversity, which is also a form of desertification. This return of forests where the grazing pressure is insufficient to prevent regeneration can be a feature of other landscapes This is why in the Estonian alvars grazing is so important and in the Tatra mountains in Poland too.

3. Interaction with wildfires. Fire is a powerful means to control vegetation unpalatable to animals and Mediterranean pastoralists have known this since ancient times. Pastoral wildfires therefore are an established tradition in several parts of the Mediterranean (e.g. Crete, Sardinia and Corsica). In Greece, for example, a large proportion (25%) of the fires every year is caused by pastoralists. Wildfires are set during summer, when temperatures are high and vegetation dry. With the advent of the first autumn rains, regeneration of the vegetation occurs in the burned areas through stump sprouting

or prolific seed germination. To make use of this fresh feed, pastoralists put high numbers of animals into recently burned areas, thereby overgrazing the palatable in favour of the unpalatable species. Without competition from the palatable species, the unpalatable grow fast and come to dominate the burned area, thus forcing pastoralists to set another wildfire in order to control them. This is a vicious cycle that leads to denuded landscapes.

In the UK by contrast heather moorlands need to be burnt too, in order to provide fresh growth for sheep and grouse alike but this is usually carried out in strictly controlled ways so that damage is minimal. Although it does occur and fire may get into the underlying peat and smoulder for weeks or months.

4. Social impact. Social factors related to social devaluation of the pastoral profession and high opportunity cost of labour, will certainly limit farming activities in the future.

According to the EU agricultural land management has been a positive force for the development of the rich variety of landscapes and habitats, including a mosaic of woodlands, wetlands, and extensive tracts of an open countryside. The ecological integrity and the scenic value of landscapes make rural areas attractive for the establishment of enterprises, for places to live, and for the tourist and recreation businesses. Many valuable habitats in Europe are maintained by extensive farming, and a wide range of wild species rely on this for their survival. But inappropriate agricultural practices and land use can also have an adverse impact on natural resources, like pollution of soil, water and air, fragmentation of habitats and loss of wildlife.

Desertification of grazing lands and pastoral landscapes can be mitigated if the degradation process is reversible. This is the case when the vegetation has not been totally removed and soil erosion has not become accelerated. Fortunately, degradation in the majority of grazing lands of Southern Europe is reversible. This is because Mediterranean ecosystems are very well adapted to livestock activities. Even if aboveground vegetation is removed, there are always underground organs (e.g. rhizomes, stolons and bulbs) or rich soil seed banks by which most species can recover if grazing pressure is removed. Some species can be suppressed by grazing for years but still recover if grazing is suspended. Also, rangeland soils can recover from trampling if animals are removed for some time.

Finally, animals can be used to control vegetation overgrowth thus increasing the efficiency of the lanes against wildfires and help thinning the forest. This is why forests adjacent to grazing lands can be used for animal grazing during the summer months when pasture growth is limited or dried up. Such forests can be properly treated so that livestock use them without damage to the forest growth.

The appropriate selection of breeds which are suited to the landscape, the correct assessment of grazing capacity and the use of management tools such as fire in very carefully controlled manner are essential if the ecological as well as the aesthetic and cultural values of pastoral landscapes are to be maintained.

5. CONCLUSIONS

This report demonstrates that sheep farming and pastoral agriculture varies in importance in terms of its effect on the landscape. In some of the countries evaluated here, such as the UK, very large expanses of the upland have been given over to sheep farming and the effects of continued grazing over hundreds of years has resulted in a series of large-scale open landscapes with heavily modified vegetation, smooth textures, soft colours and very low tree cover. Structures such as drystone walls and field barns made from local materials also add character to these areas, while the variation in



Maintaining sheep grazing on coastal meadows on the islands in Estonia is important for keeping the biodiversity values of these old grasslands. They are as much cultural as natural landscapes. Using the old types of sheep is also important because they live very well and stay healthy on these lands and also graze in such a way that the botanical composition of the pasture is maintained. Source: A. Ader



The heather moors of North-east Yorkshire were cleared of forest and turned into dry heathland dominated by heather (*Calluna vulgaris*) and bilberry (*Vaccinium myrtillus*) sometime in the Bronze Age or thereafter. They are managed by a combination of sheep grazing and periodic controlled burning which also benefits the grouse. The habitat value of the moorland is high but this is a cultural landscape. Source: S. Langridge, Flickr, CC BY-NC



Grazing is necessary to ensure that the open grassy meadows retain their place in the landscape for ecological as well as cultural reasons, Bieszczady Mountains in Poland. Source: animisiewaz, Flickr, CC BY-NC

stone around the country give added diversity to the landscape. In Greece and Bulgaria, too, sheep breeding and pastoral agriculture has a large-scale effect on the landscape of many areas, although in the case of Greece, sometimes with negative effects on the landscape and ecology. Once again, human elements associated with shepherding add character and a unique spirit of place to many landscapes which also exhibit great time depth because of the persistence of traditional forms of pastoral agriculture which have survived until the present day but which may not survive much longer.

It is well known, that from the antiquity, we had a kind of symbiosis among forest and sheep. When the number of herbivores increased exaggeratedly, then the carnivores restored the balance of the ecosystem. Nowadays, man has to play this role. In some forest/national parks of Attica in Greece, sheep are used to reduce the understorey vegetation (grass or shrubs). Traditional systems, which are more concerned with the relatively long term preservation of a level of soil fertility and resources availability, seem more viable and sustainable models.

In France the role of sheep farming is also large but has not had the same effect on the landscape as in the previous countries in part because the main grazing areas in uplands are more limited and sheep farming in mixed lowland areas where the direct effect of sheep on the landscape is not so obvious, mixed as it is with other forms, tends to be prevalent. In those areas, such as the Pyrenees, where sheep have long had a major role in pastoral agriculture and where the landscape has also been affected. The same is the case in Poland where the majority of the country is flat or rolling and intensively managed for mixed agriculture with only limited areas of upland and mountain along the southern border. It is in these areas that the characteristic pastoral landscapes have emerged over the years.

Estonia is an example of a country where the role of sheep farming is relatively small and where sheep grazing nowadays is more important for ecological management of small-scale areas, although these special landscapes are extremely aesthetically and culturally valuable too.



Severe overgrazing in Greece leads to ecological damage in dry conditions. Soil erosion is a problem and it is difficult to maintain any vegetation cover in these conditions. Source: Mr G's Travels, Flickr, CC BY-NC-SA

Sheep, shepherds and sheep farmers have therefore been, over many thousands of years, major shapers of landscapes which many people think are naturally open and treeless, windswept, remote, wild and beautiful. Too many sheep, often the result of blunt instruments such as EU subsidies, has damaged many places but with a greater understanding of the use of correct sheep breeds and stocking densities pastoral landscapes can be retained for the future. The European landscape would be a lot less interesting if sheep ceased to be a major agricultural sector in the uplands and mountains, coastal pastures, heathlands and other places where they are most suited.

Socio-political measures to support sheep farming and grazing

The **Common Agricultural Policy (CAP)** acknowledge the contribution of farming over the centuries to create and maintain a unique countryside, therefore one of the main axes is to preserve 'natural' farming and forestry systems, and traditional agricultural landscapes. This is why the CAP ensures that its rules are compatible with environmental requirements and that CAP measures promote the development of agricultural practices preserving the environment and safeguarding the countryside. Farmers are encouraged to continue playing a positive role in the maintenance of the countryside and the environment.

This is achieved by:

- targeting aid at rural development measures promoting environmentally sustainable farming practices, like agri-environment schemes;
- enhancing compliance with environmental laws by sanctioning the non-respect for these laws by farmers through a reduction in support payments from the CAP.

The socio-political measures which may be taken in order to support sheep farming and grazing are the following:

1. *Resolving management problems for communally grazed lands.* This can be done by developing grazing management plans and encouraging farmers to follow them so that overuse is avoided.

2. *Institutionalizing the use of livestock as management factors in protected areas.* Livestock grazing in protected areas is instrumental in preserving high biodiversity. Currently it is not practiced universally in Europe because of several obstacles including the negative attitude of conservationists towards livestock in particular areas, such as Greece, while it is well-recognised and used elsewhere, such as in Estonia.

3. *Supporting the use of local breeds.* Local breeds use native vegetation more efficiently than others. Support could be financial (e.g. subsidies or prices of the products) or institutional (e.g. only local breeds to be used in certain areas). Some of these breeds are rare and need to be conserved - often by using them on landscape management projects where they are not needed for meat or wool

4. *Promoting the development of quality animal products.* This will encourage farmers to reduce the overstocking and to concentrate on fewer but more productive ones including those which produce special products, be it cheese, meat or wool.

5. *Diversifying the farming income.* Farmers can diversify their income from grazing lands by promoting other activities such as honey production, wild plant collection and agro-tourism.

6. *Institutionalizing the use of prescribed fire to improve grazing lands.* The legitimate use of prescribed fire can alleviate many problems caused by misuse or overuse because it will be used judiciously without causing desertification or other problems such as peat damage.

7. *Economic support of farmers.* Such support is needed when farmers have to comply with a specific plan to conserve ecosystems by certain grazing practices or management by fire in their grazing land. It could be direct (subsidies) or indirect (prices of products).

8. *Farmer education.* None of the sensitive management or mitigation strategies will completely succeed unless farmers are properly informed and convinced of the need for better stocking and land management practices, especially where these have been used improperly for centuries, such as too high stocking or bad fire management. This means that they should be educated accordingly about the negative impacts on the landscape. Such education can be organized through field days in each region, demonstrating what measures to take in order to improve the situation without jeopardizing the farmers' economic prospects.

9. *Land tenure.* Sometimes, problems of grazing lands and landscapes could be caused by land tenure conflicts, issues over grazing rights and changes caused when farmers give up grazing and no one is interested in taking over the pasture released from grazing. These ought to be resolved before undertaking any other measures to mitigate poor practices of other varieties.

10. *Administrative conflicts.* Several administrative agencies are usually involved in livestock husbandry, especially where grazing land does not belong to farmers but to the state or community. In this case conflicts arise between these agencies on how to prioritize the use of the land and for what group, for example for protection and reforestation or for grazing; or, alternatively, for livestock or arable farmers.

Sheep farming as a tool for cultural and ecological landscape management – future trends

The environmental effects of sheep farming have already been noted. Sheep breeding plays a key role in environmental protection, which includes natural maintenance of less fertile areas, bio-diversity, preservation of sensitive ecosystems and of water quality, furthermore, it helps prevent soil erosion, floods, avalanches and fires.

For a biotope network with nutrient-poor and wet or dry sites, sheep grazing can be an important tool. Due to their lack of economic viability for other land uses, there is often a risk that these valuable biotopes will cease to be managed and maintained and will revert to less desirable semi-natural types. Furthermore, these areas are in many cases being drastically reduced, with remaining nutrient poor grasslands often becoming isolated, as is found in Greece for example. Site gradients are being lost, successional processes terminate at stages of maturity, and there is a lack of new pioneer sites. Traditional grazing using sheep can ensure the sustainable management of these sites. To this end, testing and development of practicable area management methods are required in cooperation with sheep farmers and landowners.

Flocks of sheep can also promote the dispersion of species between individual areas by transporting seeds and plant propagules and, in rarer cases, even small animals. This can be very important for the exchange of genes and species between isolated areas.

Contribution to contemporary culture

Up to the 1960s the Greek islands were working under conditions of a more-or-less closed economy. This led in the production of plenty of local products which nowadays sell into niche markets which have become famous for their quality and closely linked to the traditions and customs of the islands. These local products are considered today to be part of the national heritage. For instance, 5 out of the 20 Greek cheeses which have been recognised as products of Protected Geographical Nominations are produced in the islands of the Aegean Sea. This is something which can be found to greater or lesser degrees in most sheep countries – French cheeses, Scottish tweed cloth, Welsh lamb and many other aspects which are in many ways seeing a revival as people rediscover good quality products of all kinds associated with regions and landscapes – and where as tourists they can enjoy the products while experiencing the landscape too.

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