



This series of eight Information Notes and accompanying video are intended to provide a brief introduction to some of the issues facing pastoralism in Europe today. They were produced as part of the output from the PASTORAL project, an EU-funded Concerted Action which considered the agricultural, socio-economic and ecological characteristics of high nature value pastoral systems in Europe.

The PASTORAL project was steered by a consortium consisting of the Scottish Agricultural College (UK), European Forum on Nature Conservation and Pastoralism, ALTERRA, (The Netherlands),

Institute for European Environmental Policy (UK), Asociacion para el Analisis y Reforma de la Politica Agrícola (Spain), Universidad Autónoma de Madrid (Spain), Escola Superior Agraria de Castelo Branco (Portugal) and Coordination Paysanne Européenne (Belgium).

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Further detailed information on the PASTORAL project and European pastoralism can be found at:
www.sac.ac.uk/envsci/external/Pastoral/default.htm

Basic ecological principles of relevance

- In general, there will be a greater range of different types of organisms living within any one area when that area:
 - Contains a greater range of different types and structures of niches (i.e. potential places for different organisms to live within and utilise). Hence, semi-natural vegetation contains a wider range of associated organisms than monocultures (or other heavily 'utilised' agricultural habitats) since the former contain a larger range of types and structures of plants. Structural heterogeneity can not only be obtained via having different plant species present but can also be achieved through differences in management applied to the same types of plants.
 - Is subject to medium levels of disturbance through climatic (e.g. flooding, exposure) or management (e.g. grazing, cutting) factors. Situations with low or high disturbance both lead to a greater uniformity in the type and structure of the vegetation present and hence less opportunities for different organisms to colonise and live within that area.
 - Occurs at a large enough scale to allow natural senescence/development of conditions in part of the area while suitable conditions appear or are maintained elsewhere. In addition, not only are larger areas required to support larger numbers of individuals (and hence increase population viability) but also a variety of slight differences in conditions across an area can be important in maintaining 'refuge' populations of organisms under any conditions.
- Hence, a wider range of species will be found in an area where there is heterogeneity both at the 'local' (in terms of vegetation composition and structure) and wider

landscape (in terms of greater mixture of different habitat types - grassland, woodland, wetlands etc) scale.

The link with pastoral systems

- The biological importance of these systems relates both to the spatial and temporal diversity that they introduce. In a spatial context they produce a patchwork of habitats - meadows, grass pastures, crops, woodland, fallows, natural pastures (including alpine, heath, moorland, saltmarsh, marshland, bog, wood-pasture) as well as more intensively managed land around either settlements (mostly in southern Europe) or farmsteads (mostly in the north). In a temporal context not all fields or areas are managed in the same way at the same time; so neighbouring farms with essentially the same production systems will sow and harvest crops at different times. This produces a patchwork of the same crop at different stages of development; ploughed ground, seedbed, young crop, mature crop, cut crop and harvested crop. In many mountain areas harvesting of a crop of grass or cereals takes place progressively rather than on one occasion - complete mowing and harvesting taking several days or weeks (depending on labour available and suitable weather conditions). In a similar fashion adjacent pasture under different ownership will be grazed in different ways (e.g. with different animals and at different stock densities) and at different times of the year. This diversity provides much more favourable conditions for plants and animals (especially invertebrates) to find areas with suitable conditions for them to complete their life-cycles¹.
- The pastoral systems forming the focus of the PASTORAL project are therefore of high nature value because:
 - They continue to utilise a high proportion of semi-natural vegetation. Although this may be largely by default (in that climatic and topographic constraints limit the possibilities for intensification of the management of the vegetation) the outcome is that there is a greater range of ecological niches available over much of the area utilised within the pastoral system.
 - These climatic and topographic constraints also generally mean that not all of the land in an area is available for utilisation by all the different components of the system (e.g. grazing by domestic animals, growth of fodder crops). Hence the semi-natural vegetation is generally also found within a mix of more natural habitats and features.
 - The constraints imposed on the vegetation by climate and topography also put constraints on not only the type but just as importantly the timing of the management that can be imposed on that vegetation. Hence the annual management associated with the pastoral system is generally synchronised with the annual natural growth cycle of the vegetation. Hence management is not being imposed at a time which would be detrimental to a wide range of the plant species involved.
 - For most of the year, the nutritional value of such semi-natural vegetation is generally low for any standard unit area. This in itself places limits on the number of animals that can graze that area and also leads to a need for larger

¹ Bignal, E.M. & McCracken, D.I. 2000 The nature conservation value of European traditional farming systems. *Environmental Reviews* 8 149-171

areas to utilise. Hence, grazing pressure on any one area is either generally either low or (in closely shepherded flocks) only high for a very short period and hence leads to a greater heterogeneity of vegetation structures. For example, in some pastoral systems (such as in parts of the uplands and moorlands of Britain and Ireland), low densities of livestock occur within large areas of unenclosed semi-natural vegetation. The free-ranging livestock grazing patterns which result can mimic that of wild grazers. Conversely, in many other pastoral systems (such as those involving seasonal grazing of alpine pastures), the livestock are present in flocks and herds in higher densities. In these situations, close shepherding and regular movement of the livestock ensures that the pastures are utilised to the best effect without any adverse impact on the semi-natural vegetation.

- The limits to nutritional value and climatic/geographical constraints also generally mean that any one area is not utilised throughout the year - or if it is, it is utilised at very low level through the main winter months. This again serves to keep the utilisation pressure in synchrony with the main periods of vegetation growth and hence increase the chances of wider range of organisms existing in association with these systems.
- The associated need to produce winter fodder (to carry animals through the winter) and the constraints on the amount of fodder which can be grown (because of limits to land availability and growth of fodder vegetation) mean (a) that there is a limit to the total number of animals that can be supported and (b) there is a need to move animals to other areas during the period of growth and harvesting of winter fodder during the summer. This means that animals are moved from area to area (thereby reducing pressure when animals are not present) and that fodder crops themselves generally introduce heterogeneity and ecological value into the landscape where they occur.
- In many areas, including Romania and especially over much of the Mediterranean, forage deficits are met by moving livestock long-distances to take advantage of seasonally-available pastures. This practice, known as transhumance, has the potential to connect very different habitats within the same pastoral system. It should also be noted that in northern European and mountain areas this forage deficit generally occurs during the winter months, but in southern and eastern Europe climatic conditions are such that this deficit occurs during the summer and autumn period.
- Grazing by livestock introduces small scale perturbations to the vegetation resulting in an increase in biodiversity. Hence their herd behaviour can introduce seasonal and cyclic pressures which are virtually impossible to produce in any other way - not only through their grazing but through their trampling, dunging, resting and ruminating in favoured places and selecting foraging areas in relation to the seasonal availability of herbage.
- The habitats of many species (such as the marsh fritillary butterfly *Euphydryas aurina*) are naturally unstable and it is natural for colonies to die out and new ones to appear when a suitable niche becomes available. These pastoral systems and associated practices are practised at a scale and intensity which allows these cycles of colonisation and re-colonisation to take place.

Box 1. The biological value of pastoral systems can be described at several scales

Within-patch This is, for example, the diversity of plant species within a vegetation patch in a field or pasture. It is mainly affected by grazing pressure and by local edaphic conditions.

Among patches This is characterised by differences in vegetation composition and structure within a single pasture or field. This is mainly the result of contrasting micro-environment conditions and grazing pressure. It increases the diversity of plant species within the pasture, but also of invertebrates and small (or even large) vertebrates by creating contrasted habitat conditions. It also benefits animals which need different habitats within close proximity (e.g. insects or small mammals which hide or breed in high vegetation but feed in low cover). The resulting heterogeneity may be in the form of a mosaic (e.g. pastures on the island of Islay, Scotland) or a gradient (e.g. steppe pastures in La Crau, France).

Within farm - the diversity of land-uses within a single farm. This results mainly from the functional necessities of livestock farming, e.g. the need to grow hay or crops for winter fodder, while retaining pastures for the rest of the year. The resulting diversity in land-use benefits vertebrates and invertebrates which may require different habitat types at different times of the year, or which may need to simultaneously use different habitats (e.g. steppe and hay-fields for wintering little bustards or for breeding stone curlews in La Crau). It also directly results in an increased level of plant and animal diversity at the farm level.

Among farms - this is characterised by the diversity of practices among local farmers. This may result from differences in environmental conditions among units (e.g. ground, slope, exposure), but also from differences in farming practices due to the individual decisions of farmers both today and in the past. It results in an increased diversity of land-uses at the local landscape level, and more importantly in the timing of farming activities such as grazing, ploughing, sowing and cutting/harvesting. As a result, a single habitat-type (e.g. hay fields) may exist at various states of growth in the local landscape (e.g. uncut, and various stages of re-growth) at any given moment. This would favour any natural asynchrony in the timing of activities of individuals of a species, as well as higher overall species richness, by allowing the coexistence of species that require different stages of the same habitat.

- Finally, these pastoral systems are much more favourable to a wider range of species (especially the larger vertebrates) since the fact that they are practised over a wider scale means that (a) the conditions required at any one time of year (especially by more mobile species) can be found at a wide variety of locations and (b) the different requirements by these species at other times of year are catered for, i.e. the mix of structures and habitats in any one area changes through the year. The different scales of spatial and temporal diversity produced by pastoral systems are highlighted in more detail in Box 1.

Conservation implications

- The key characteristic of high nature value pastoralism is that semi-natural vegetation provides the majority of the livestock's forage requirements. Most of Europe's important semi-natural vegetation habitats (e.g. alpine and calcareous grasslands, heathland, moorland and wood pastures) have developed alongside pastoralism, for as long as 10,000 years in some regions. The conservation of open semi-natural habitats is therefore highly dependent on the continuation of appropriate pastoral practices².
- Within the EU, pastoralism often only remains in regions where climatic and topographic constraints limit the potential for intensifying the management of land and converting semi-natural vegetation into arable or grass monocultures. Often these regions are mountainous and remote (e.g. Romanian Carpathians), they may be too dry (e.g. much of the Mediterranean falls into this category) or they may be too wet

² PASTORAL (2003) *An introduction to European pastoralism*. PASTORAL Information Note 1

(e.g. the north west fringes of Britain and Norway). In addition, large areas of semi-natural vegetation still occur in many countries of central and eastern European where semi-subsistence agriculture has survived for social and political reasons.

- In many pastoral systems, the need to produce hay or other fodder crops means that animals are moved elsewhere in summer months, usually to high alpine and sub alpine pastures in mountain regions to take advantage of the seasonal flush of plant growth. In many areas, including the mountains of Romania and particularly the Mediterranean, forage deficits are met by moving livestock long distances between seasonally available pastures, a practise known as transhumance.
- Livestock play an important role in dispersing many species, and maintaining connectivity between habitats, through their dung and by external transportation. In the dehesas (wood pastures) of Spain, it has been shown that cows disperse more species through dung than any other herbivore. It has also been estimated that a flock of 350 sheep could potentially disperse 3 million seeds per year³. By the same token, work on calcareous grasslands in Germany have described how large connected areas of these habitats came into existence during the main period of sheep transhumance between the 15th and 20th centuries. The genetics of distant populations of *Bromus erectus* (upright brome) on the same transhumance route have been found to be more similar than nearby populations on different routes⁴. At present in Germany, chalk calcareous grassland remnants are maintained by conservation management techniques such as mowing. Not only are these techniques expensive but they are fail to maintain the connectivity between fragments as transhumance once did, and indeed still can in countries like Spain and Romania.
- Livestock carcasses are important for a wide variety of species. Studies of Highland cattle carcasses in a Dutch nature reserve have revealed an invertebrate fauna of over 160 different species - i.e. more than the number of breeding birds recorded in the same reserve. However, unless found in a late stage of decomposition, carcasses of cattle, sheep, horses and goats (but not wild animals) have to be removed under Dutch legislation. Removing livestock carcasses that are not infected with a contagious disease (or the botulism bacteria) means that the local environment is deprived of nutrients, invertebrates are deprived of microhabitats and vertebrates are deprived of carrion.⁵.
- Many semi-natural pastoral habitats have become fragmented due to agricultural abandonment and intensification. Fragments of habitat contain fewer ecological niches and fewer and smaller populations so stochastic events (e.g. climatic variations, predators and parasitoids) will have far greater impacts. The distance and connectivity between populations will influence whether recolonisation of fragments can occur. The more isolated habitat fragments are, the less likely they are to be recolonised.
- The ecological principles and interactions set out in this paper all contribute towards the argument for landscape scale conservation measures. In pastoral areas, the effectiveness of these measures will depend upon viable, functioning extensive

³ Presentation by Begoña Peco and Juan Malo at 3rd Project meeting, Isle of Islay, Scotland, June 2002.

⁴ Willerding, C. & Poschlod 2002 Does seed dispersal by sheep affect the population genetic structure of the calcareous grassland species *Bromus erectus* *Biological Conservation* 104 329-337

⁵ Presentation by O Vorst at 3rd Project meeting, Isle of Islay, Scotland, June 2002. An indication of the importance of carcasses for invertebrates can also be obtained from Vorst, O. & Huijbregts, H. 2001 *Drie ptiliiden van runderkadavers nieuw voor de Nederlandse fauna (Coleoptera: Ptilidae)*. *Entomologische Berichten Amsterdam* 61 134-141

livestock systems. In order to maintain the spatial and temporal diversity of pastoral farmland, at the full range of scales, farmers must be allowed flexibility in management. However, the current model for most agri-environment schemes generally acts to homogenise these practices. On the island of Islay, for example, farmers who enter the local Environmentally Sensitive Area scheme are not permitted to cut silage before 1st August in order to provide cover for nesting corncrakes (*Crex crex*). This not only disadvantages farmers who are unable to take advantage of good spells of weather before this date, but also chough (*Pyrrhocorax pyrrhocorax*) fledglings which require a temporal succession of harvested silage fields for feeding.

- Explaining in simple terms the complex ecological actions between pastoralism and nature has to be a high priority if meaningful and effective conservation strategies and environmentally sensitive agricultural policies are to be developed. A high priority for the future is therefore to determine the best policy mechanisms to sustain temporal and spatial ecological diversity. But to achieve this requires answering the question: '*what is causing the homogenisation of livestock farming practices*'? This needs to become a broad debate and should not be constrained by narrow-thinking that regards production support as intrinsically bad and support for rural development as good.
- The biodiversity value associated with a wide variety of semi-natural habitats throughout Europe has been created and needs to be maintained by pastoral systems. In all cases, taking the land out of agricultural production is not the appropriate choice for biodiversity conservation, but rather it is vital to ensure that the intensity of management is correct. However, the historical role of pastoral systems in creating and maintaining much of the semi-natural vegetation found across most of Europe is still not fully appreciated by many ecologists, conservationists, policy makers or the general public. Nor is the fact that for many landscapes, habitats and wildlife communities of high nature value, the only practical, socially acceptable and sustainable management involves the continuation of pastoralism.

A total of eight Information Notes have been produced from the PASTORAL project:

- 1: *An introduction to European pastoralism*
- 2: *The need for a typology of European pastoral systems*
- 3: *The nature of European pastoralism*
- 4: *Examples of European pastoral systems*
- 5: *Trends and threats to the viability of European pastoral systems*
- 6: *Potential policy approaches to support European pastoralism*
- 7: *Gaps in the understanding of European pastoralism*
- 8: *European pastoralism: farming with nature*

Many of the points in these Information Notes are illustrated by examples taken from the location of the four main workshops held during the course of the project, Sierra de Guadarrama Mountains (Spain), Transylvania (Romanian Carpathians), Isle of Islay (Scotland) and the plain of La Crau (south-east France).

These Information Notes were compiled by Sally Huband (the dedicated officer employed by SAC on the PASTORAL project) with additional input from the other members of the project steering group: Davy McCracken and Gwyn Jones (SAC), Eric Bignal (EFNCP), Berien Elbersen (ALTERRA), David Baldock and Harriet Bennett (IEEP), Guy Beaufoy (Spain), Begoña Peco (UAM), Luis Pinto de Andrade (ESA-IPCB) and Gerard Choplin, Isabel Bermejo and Jesús Garzón (CPE). The project meetings enabled us to consider and discuss the future of pastoral systems with many colleagues drawn from our own institutes and elsewhere throughout Europe, and we offer our thanks to them for their useful contributions towards the development of many of the views presented here.