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# The historical and contemporary importance of herbivores for biodiversity

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## Summary

Landscapes, created by the grazing of free-ranging herbivores, were once common in Europe — at first due to wild herbivores and later large-scale free-ranging cattle and sheep, their domestic counterparts. These landscapes are changing through agricultural intensification or abandonment. Some low-intensity large-scale systems survive, but their functional importance for nature conservation is not usually recognised, e.g. in developing agri-environmental schemes. There is a strong case from a nature conservation viewpoint for maintaining extensive grazing systems widely across Europe. From an ecological perspective, it is probably true that, for many plants and animals, viable populations will survive only where land can be managed at landscape scale. Major elements characterising these extensive systems include: free-range management systems; mosaic habitats; and non-static locations of vegetation types. It is important to develop

mechanisms for maintaining extensive and dynamic grazing systems, rather than tightly controlled systems characterised by many small compartments and high overall grazing pressure.

## 1. Introduction

Dehesa in Spain Photo: Natacha Yellachich

The biodiversity of European open habitats is declining, because the systems which formerly maintained these have broken down.

Until relatively recently, people were a closely integrated part of the regional farming systems. Developments had taken place gradually over long periods so that human use and wildlife had developed alongside each other. Many of the wildest and most remote parts of Europe are in fact farmland, and farming has been the major influence in creating these landscapes. These habitats and their associated wildlife are sustainable only through the continuation of long-established management practices.

This paper considers:

The past: the historical and ecological context of European grazing systems

The present: what effects are current agricultural policies having?

Survivors in the present: environmentally sustainable farming systems

The future: what is the vision for Europe's countryside in the 21st Century?

Working with the systems: the functional components

Ecological impacts of grazing animals

What is needed to improve matters?

## 2. The past: the historical and ecological context of European grazing

## systems

Over most of Europe, humans have been present since the end of the last glaciation. In the post-glacial forests, large herbivores opened — or kept open — patches in forests, enabling grassland species to survive. Frans Vera's work in the Netherlands indicates that this probably resulted in a cyclical succession of forest and grassland habitats (see Kampf 1999).

Low-density cattle grazing in Scots Pine woodland, Scottish Highlands Photo: Roy Dennis

The wild ox or aurochs *Bos primigenius*, the native ancestor of domestic cattle, along with other mammals, such as elk *Akes akes*, beaver *Castor fiber* and wild boar *Sus scrofa*, as well as fire, had profound influences on the structural and ecological diversity of the original forests. Low-intensity rearing of traditional cattle on large home ranges, including woodlands and hill pastures, replicates in many ways the activities of the extinct wild aurochs. Examples of damage caused by cattle to small woods and moorland in recent decades are usually due to too many cattle being kept in too small an area. The grazing of a large herbivore is important for recycling plant material, for increasing plant biomass and for diversifying plant communities. The movements of cattle cause structural changes in plant communities, including tree growth, as well as creating pathways, open areas and disturbed water margins of benefit to a range of smaller wildlife.

Shepherds move their flock along one of the long-distance drove-roads (cañadas reales) of Spain. In many cases, modern roads (right) have followed the long-established cañada routes. This photograph was taken during the Project 2001 scheme to

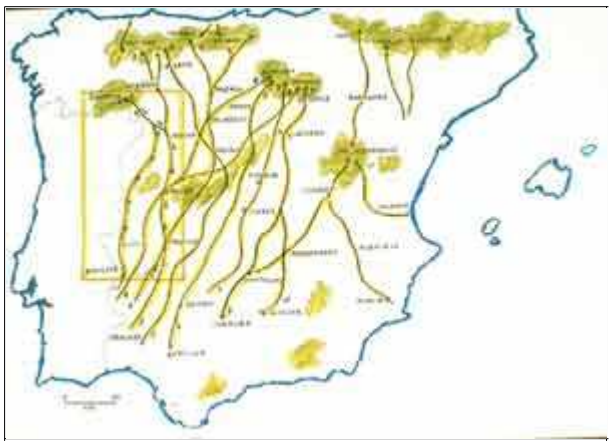
Cattle dung is of supreme importance. It is a rich source of nutrients and is colonised by huge numbers of invertebrates, which are important food for many birds and mammals. One cow produces about 4 tons of dung per year, but also an annual insect population weighing about a quarter of her own body weight.

For thousands of years, farming systems and livestock breeds developed within local environmental conditions. A highly developed and integrated regional livestock farming system evolved, with distinct local breeds of sheep, pigs, cattle and horses. These systems supported rich wildlife populations and hundreds of generations of people — about as close to proof of sustainability as you could hope to find!

re-establish the use of the cañadas reales because of their environmental and cultural importance.
Photo: Jesus Garcon

The common characteristics of these farm systems were that they were low-input, low-output, usually labour-intensive, and economically and ecologically sustainable. These farm systems have enriched Europe's open-ground flora and fauna by enhancing diversity of habitat, while maintaining the large-scale open habitats. The pastoral exploitation of mountain regions could be accomplished only by transhumance, leading to the development of long-distance drovers' roads; these came to possess peculiar floras arising from seasonally intensive grazing (Bignal & McCracken 1993, 1996; Tubbs 1997).

This interaction has given rise to many of the aspects we think of as central to the characteristic regional cultures of Europe — landscapes, wildlife including flowers and bird-song, villages and farms, quality foods and drinks.



Map of the cañadas reales of Spain, the drove-roads allowing seasonal movements of livestock between summer and winter grazings.
(LINK TO FULL-SCREEN MAP)
Map: Isabel Bermejo (La Cañada, no 1, pp 6-8, 1994

## 3. The present: what effects are current agricultural policies having?

In the second half of the 20th century, there has been a new kind of disruption in the European ecosystem. This has involved a massive decline in biodiversity. In the past, wildlife had been able to adjust and exploit the agricultural situations because modifications to the environment had been gradual. However, in the last century and particularly in recent decades, this has changed. Modern machinery and agro-chemicals allow rapid changes to the farmed environment over huge areas, to impose a high-input, standard, factory landscape over the previous characteristic regional features. Other areas have been abandoned.

The rapid modernisation of northwest European agriculture has resulted in intensification, marginalisation, concentration and specialisation of farming. This modernisation continues today in southern Europe — and has begun, and is certain to increase, in central and eastern Europe. It has resulted in a fundamental imbalance between farming and the environment.

There are many costs to Society of these changes, but the range of these impacts is often overlooked. One of the major costs is to wildlife. This is important in itself, but also provides some measure of the degree of sustainability of our actions.

Some of the best monitoring data are for birds (Pain & Pienkowski 1996; Tucker & Heath 1994). For example, skylarks *Alauda arvensis* are declining throughout western Europe. The central and eastern European populations are expected to follow, if those areas make changes under pressure from western countries. Other species have already gone. The corncrake *Crex crex* was a common feature of

farmland throughout Europe until earlier this century, as is well attested in popular stories and poetry. It is declining throughout Europe. In the British Isles, its progressive restriction to a few Hebridean islands and parts of Ireland match well the introduction of mechanisation and tidy fields.

The intensification of agriculture has had other major impacts on both the human population and wildlife. The quantities of fertilisers used have increased markedly in recent decades. Much of this finds its way into the water supply. In 26 countries of Europe, the European Environment Agency has reported that groundwater pollution by nitrates, largely from agriculture, is a risk to human health. The problem with pesticides is even more widespread than for nitrates (Stanners & Bourdeau 1995).

Other examples of the costs to Society of the intensification of agriculture are given in the Forum's seminars (Mitchell 1996; Goss *et al.* 1997; Goss *et al*. 1998; Beaufoy 1998; Hindmarch & Pienkowski 1999).

The essence of the Convention on Biological Diversity is that wildlife cannot be conserved just in enclaves, but its conservation depends on this being integrated in other sectors of human activity, whether these be agriculture, fisheries, transport, industry or whatever. This is intimately related to undertaking work in an environmentally sustainable way.

Aerial view of former upland grazings replaced by large-scale afforestation by even-aged plantations of closely planted exotic tree species, Scotland. The distorting economic effects of government policies on farmers often lead to intensification of operations on the more productive land and the abandonment – or selling off for forestry of the hill-land. Both intensification and abandonment tend to lead to loss of biodiversity.
Photo: Mike Pienkowski

## 4. Survivors in the present: environmentally sustainable farming systems

Turning to that formerly highly environmentally sustainable activity, farming, we can ask:

- Do more sustainable farming systems still exist?
- What policies do we need to maintain and restore environmentally sustainable farming systems?
- What practices on the ground do we need to maintain and restore these high-nature-value systems?

These questions represent the focus of the work of the European Forum on Nature Conservation and Pastoralism. The Forum is a pan-European non-profit network to exchange information, identify conclusions, and inform policy development. To achieve its aims, the Forum holds conferences every two years, organises workshops and seminars, and produces two issues per year of the newsletter *La Cañada*. As we explain in the leaflet circulated at this conference, shortage of funds has meant that we have been able to produce this in English only. We would, however, like to include some French-language material in the future and would welcome articles for *La Cañada*.

One of the Forum's means of making its work available to policy-makers is the series of seminars. These involve both non-governmental and governmental/Commission personnel, and are particularly noted for bringing together people working at European policy levels, and those farming and managing land for conservation on the ground.

European Forum on Nature Conservation and Pastoralism, with partners, identified some years ago the need for information on where such farming systems of high nature value still exist. Research work

undertaken to fulfil this included the initial identification and typology of low-intensity farming systems in nine European countries (Beaufoy *et al.* 1994; Bignal *et al.* 1994; Bignal 1998). A summary map of areas in which low-intensity farming systems still occur and an outline of the typology are available as a poster/booklet in several languages. One can also see the French, Spanish and English versions on the Forum's web-site (www.efncp.org). We are also very pleased to be launching today the French-language version of the original report. We are grateful for support from the Netherlands Government for this translation. (Copies are available for participants in this meeting.) The Forum plans to develop this typology to link more closely agricultural systems, their ecological processes and wildlife value, as well as extending its geographical coverage.

## 5. The future: what is its vision for Europe's countryside in the 21st Century?

There is a shift in favour of the integration of nature conservation into holistic rural strategies. The shift is firmly enshrined in international law through the Ramsar, Bern and Rio Conventions. Within the EU, these are reflected in the Birds and Habitats Directives. And the Common Agricultural Policy reforms have made quite explicit the desire to develop environmental management as an objective of agriculture policy. But to be successful, this must be guided by a vision of the future rural countryside.

A biologically rich mosaic of habitats resulting from the maintenance and re-establishment of traditional mixed farming in northwestern Islay, U.K. Photo: Roger Wardle, FWAG

Future policies will need to shift financial support structures away from intensive agricultural production towards broader socio-economic objectives. In these, the maintenance of low-input, biologically diverse systems and their rural communities needs to be paramount. If this is to be achieved at a scale that has ecological meaning, rural policies need to be developed which continue to have farming as their central focus.

The vision that includes nature as an essential component of the European countryside is one in which the greater proportion of the land surface will comprise a diversity of low-intensity farm systems together with large tracts of unenclosed land sustaining extensive pastoralism. This is not a vision which denies intensive production, but this may become confined to regions of naturally high productivity, in which increasingly tight management of pesticides and fertilisers is combined with technological research and development into management methods which will limit their necessity.

## 6. Working with the systems: functional components

Storks in the Biebrza Marshes, Poland. Storks are closely associated with human culture across Europe, often appearing on crests (and the logos of many European airlines). However, modern agricultural practices have caused their loss across much of western Europe. Will the same happen in central and eastern Europe?
Photo: Mike Pienkowski

Unfortunately, high-nature-value areas are still being lost. And the many in central and eastern Europe are coming under increasing pressure to match the policies of western Europe. Both conservationists and farming policy have tended to adopt the approach of single use for any piece of land. This is the very opposite of the concept of sustainable use (usually implying multiple uses), adopted now by the EU and most countries around the world in the Convention on Biological Diversity

Conservationists tend to base assessments of priorities on material worth: for example, more species or rare species. But it is only one approach. It might be considered a priority also to prevent common species from becoming rare.

More fundamentally, the material approach tends also not to take into account the functional importance of a system. This can be considered as having two aspects:

1. ecological functioning, e.g. providing habitat for plants, invertebrates, wild grazing animals, their predators etc; and
2. as part of functioning agricultural systems — important for domestic livestock and the annual farming cycle — and which interacts with ecological functioning, minimising the need for special (and expensive) management intervention.

For example, several rare annual grasses occur only on the drove roads, *cañada*, in Spain.

Another example is given in the *Proceedings* of the Forum's meeting in the Italian Alps (Poole *et al.* 1998). Several speakers outlined the system of mountain dairy farming to produce the local Fontina cheese. The cattle summer in the mountain pastures, *alpeggio*. At lower levels are the *mayenne*, used as hay meadow, followed by aftermath grazing. The cattle winter in the valleys. The annual grazing pattern for this alpine dairy system combines with the physical conditions to give rise to a great complex of separate but linked communities with rare species. Some of these are tabulated in the paper by Pauthenet & Lambertin (1998) in the *Proceedings*. In terms of ecological function, without seasonal grazing the *alpeggio* would develop into coarse grasses, less herb-rich. The *mayenne*, without hay-making and aftermath grazing, would become woody scrub.

Generally, many of these extensive grasslands of high botanical importance are associated with free-ranging, hefted or shepherded, animals — rather than enclosed fields. (There are others, often smaller patches, traditionally dependent on hay-cutting.) This focuses

on some key differences between high & low intensity:

high vs low stocking levels;
enclosed fields vs open areas — where patterns of grazing generate a moving mosaic of habitats.

In fact, a typical feature of extensive systems is that the grassland occurs as a mosaic with other vegetation. Furthermore, the location of particular types of vegetation varies as part of the cycling. This is not surprising, because the systems are what used to be described as non-climax.

Sheep and their lambs are gathered by a farmer and his sheep-dogs during management operations in a low-intensity farm on Islay in the Scottish Islands. Photo: Mike Pienkowski

Harald Plachter (1995) noted: ‘Thus traditional landuse systems often maintained a high level of dynamics whereas the structure of use is extensively fixed in "planned" and "industrialized" landscapes. Keeping in mind the crucial significance of dynamic change for the persistence of natural ecosystems (cf. Picket and White 1985, Remmert 1991) this is surely one of the most fundamental differences between traditional and modern landscapes.’

Highland Cattle freely grazing an open area at low stocking density in Islay, Scotland, in a system probably resembling the former wild state. Photo: Mike Pienkowski

## 7. Ecological impacts of grazing animals

During the early years of European nature conservation movements, grazing was regarded basically as a problem, even though in many situations it was not the grazing but the associated management activities (particularly burning, fencing and fertilising) that was responsible for changes in vegetation communities. Accordingly, very often the first management action on nature reserves was to remove the domestic grazing livestock that had been responsible for the creation and maintenance of the communities justifying nature reserve designation.

If we start from the assumption that large herbivores are a natural component of the ecosystem and that most present day so-called "natural" habitats developed under their influence, logically it is unrealistic to try to perpetuate these habitats and all their functional components, without grazing animals. For

example, in woodlands cattle can create structural diversity, and in grasslands, heaths and marsh they encourage conditions which favour floristic diversity and the micro-habitats needed by invertebrates, mammals and birds.Essentially they introduce small scale perturbations to the vegetation resulting in an increase in biodiversity (see Dennis 1999; Kampf 1999). 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 and resting and ruminating in favoured places and selecting foraging areas in relation to the seasonal availability of herbage.For instance on the heathlands of the New Forest the social behaviour of the free ranging animals isan important factor in determining the pattern and structure of the heathland vegetation (Webb 1998). Recent studies of the effects of large-scale cattle grazing in the Ukrainian Carpathians in creating the patchy habitat mosaics needed by two butterfly species (Elligsen *et al*, 1997) is an example of a growing interest in maintaining extensive cattle rearing systems where these still survive as part of a cultural landscape, rather than as small relict sites.

The problem is that few modern cattle systems utilise primitive breeds or raise livestock at densities which mimic the impact of the aurochs; indeed few cattle in much of Europe now graze in harmony with biodiversity interests. However low-intensity grazing is increasingly used in nature conservation because many nature reserves and special sites have relict vegetation communities from a former pastoral landscape.

One question for us has been whether it is possible to connect the apparently opposing objectives of a free ranging stock system of ecological value with economic viability; and if it is can be sustained. Bignal, McCracken & MacKay (1998) give examples of these systems in the Scottish islands, including examples where Highland cattle and sheep graze as herds resembling the behaviour of wild herbivores over extensive areas. What is being done there, with Highland Cattle, is linking the product to the environment in which it is produced, so that the market price takes that into account. Another good example in Hindelang, in southern Germany, is described by Roman Haug (1998) in the Aosta proceedings of the Forum. Here, there is an effective collaboration between farmers, shops and tourism industry to support the environment on which they depend. The work of ESPACE gives further examples.

## 8. What is needed to improve matters?

The EU Common Agricultural Policy addresses these issues only through Regulation 2078/92. Agri-environment programmes ask farmers to undertake environmental activities and pay any income losses and costs. The ongoing reforms of the CAP will undoubtedly place greater emphasis on this kind of programme — and increasingly on the concept of "integrated rural development" — a term which is often not well defined and which could potentially encourage rural management strategies which do not have farming at their centre. If there is a fundamental linkage between farming and biodiversity, then there is a pressing need for information to develop further the rationale of why certain styles of farming should be central to future rural development policies.

But it is unrealistic to think that a pan-European or national policy can address detailed national, regional and site specific environmental issues. What is more realistic are policies which are based on a clear understanding of the interaction between policy, the farming system and its broad environmental effects; and set priorities for action.

Mixed farming system in the Algarve, Portugal
Photo: Eric Bignal

Agriculture policy should also keep the focus of attention on the farms and the farming systems. In some respects the first phase of national agri-environment programmes have probably created unnecessary difficulties (in for example, implementation, take-up and monitoring) by having over-ambitious and demanding schemes. Many have attempted to target individual species, high biodiversity habitats or very detailed management activities; failing to do this in the context of the actual farming system. Since the present-day biological value on farmland has developed, interacting with various farming practices over many years, the importance of appropriate production systems should not be overlooked. Otherwise the situation can arise where the high biodiversity system continues to decay (through the abandonment or intensification of management practices) yet at the same time historical components of the system are targeted for environmental management.

The most influential NGOs, as well as national environmental agencies, have tended to promote nature reserve-type policies and prescriptions. These are important in their place. However, further approaches are required for farmland management at the landscape scale. Importantly, farmers often find these prescriptions illogical in the context of their own knowledge and understanding of their farming systems and enterprises. There is undoubtedly a need for more farmer involvement in the development of schemes. This is because a belief in the relevance of programmes will significantly improve take-up, and the practical knowledge of farmers could increase their success.

A much more reasonable approach is needed that accepts many of the ecological processes on farmland are not well understood, many species depend on dynamic processes and stochastic events; and distributions and numbers change due to factors not directly associated with land-use. Application of the precautionary principle and greater appreciation of the biological importance of existing practices is needed. Greater appreciation of the need for long established farming practices to remain as the central focus is needed. For example, when extensive pastoral management of farmland of high biodiversity is replaced with highly prescriptive, compartmentalised management aimed at individual species, fundamental changes to the landscape and the biological character can occur. It involves no ecological accountability with respect to overall farmland biodiversity nor other, less conspicuous species. Importantly it gives the wrong signals to farmers, namely that traditional management has to be replaced to make it of environmental value, and promotes a system of management which is not sustainable. There remains a pressing need to improve the knowledge and communication skills of those giving environmental advice to farmers.

So in many respects there is almost a need take a step back, to review how best to carry the strategy for the agri-environmental programme forward. One such strategy, that would help to develop a structured approach for schemes to follow, would be to refocus on landscapes, their wildlife and farming systems.

Farmer and sheep-dogs relax after work on a low-intensity farm, whose management generates a landscape rich in flowers and animals, Islay, Scotland. Photo: Mike Pienkowski

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