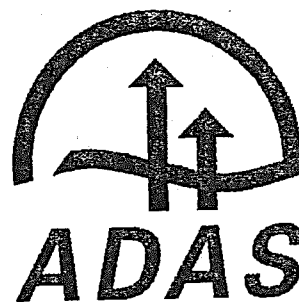


Agriculture & the Environment

Challenges and Conflicts for the New Millennium

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IMPACTS OF ANIMAL PRODUCTION SYSTEMS ON LANDSCAPES IN HILLY LESS - FAVOURED AREAS OF EUROPE.

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Abstract

Analysis by five multi-disciplinary teams working in European hill and mountain regions has been carried out to answer key questions about the relationships between landscapes and agriculture. These include: what do people (public, farmers and policy makers) want from the landscape and how do livestock systems impact upon these landscapes? The landscapes within the study areas (Loch Lomond, Luberon, Rhön, Pertouli and Matese) have been broadly characterised into: Northern Highlands; Bocage and Semi-bocage (grass fields with field boundaries); Mediterranean open fields, Montagnes (the open mountain grazings of southern Europe) using the classification of Meuss *et al.* (1990). Such classifications fail to describe the rich diversity within the study regions, but do allow the wider European context to be analysed.

Livestock use these landscapes in different ways. In the UK, hill sheep dominate the northern highland landscapes, with stock rearing and dairying systems using the bocage areas. In southern European sites, similar ruminant systems tend to use different landscape classes but in a seasonal pattern.

Impacts are very varied and differ in scale and over time. For example, management using sheep or goats prevents the spread of scrub from field boundaries or within mosaics of grasslands and woodland. Reducing grazing can thus lead to ingress of scrub into small fragments of the landscape at one extreme or wholesale conversion of a landscape to complete cover. Conversely, continual heavy grazing over very many years can lead to complete loss of woodlands from landscapes. Impacts on landscape may be direct (e.g. grazing) or indirect (e.g. maintenance of field boundaries to manage stock).

Using participative techniques, views on the use of land in the study areas were gathered. There are both common and contrasting themes on the impacts of livestock systems between the different areas. It is concluded that policy measures and agri-environmental schemes need to be tailored to local context and requirements.

Introduction

European landscapes have been created by man's activities over many centuries. Livestock farming and livestock have been very important, especially in hilly and mountainous areas where other forms of agriculture are less possible. Livestock farming is still a key land use within areas defined by the EU as 'less favoured'. The physical landscapes created have been through a complex interaction between livestock and human culture acting upon soils, geology and topography and upon vegetation processes. These landscapes are highly dynamic, even where held in equilibrium.

The cultural landscape, taking into account tradition, culture, the vegetation cover and its arrangement and direct human impact, is a highly complex subject area.

Currently, management of hilly areas within the EU strives to take into account social, economic, cultural and environmental objectives. The latter includes both nature conservation and landscape objectives. Biodiversity and nature conservation objectives are relatively clearly set, for example through the Habitats and Species Directive (92/43/EEC), though there will be debate as to how well these objectives are being achieved. To 'conserve and enhance' sums up the current approach towards biodiversity at the habitat level. However, landscape issues are less clear. Landscapes have a clear interaction with habitats at the nature conservation/biodiversity level. However, there are different views in relation to the value of landscapes for aesthetic, cultural and economic (e.g. tourism, forestry and farming) objectives. A preservation approach appears to be generally acceptable. For example, the Council of Europe (1995) called for the protection of areas where the impact of former human activities can be seen within the environment. Certain elements of the landscape are supported under the Agri-environment programme (2078/92/EEC). For example, stone walls, woodlands and heather moorland are supported by the Loch Lomond Environmentally Sensitive Area Scheme. However, is a whole landscape approach being taken?

Methods

A European project, EQULFA (Husbandry Systems and Sustainable Social and Environmental Quality) has been established to understand the relationships between landscape management, agriculture and the rural economy in Europe's Less Favoured Areas. A clear set of questions have been posed:

- What do people (public, tourists, residents, farmers, policy-makers) want?
- What are the current mechanisms that achieve change or maintenance (both biological and economic) and what changes are occurring?
- How can the 'products' of livestock farming, both direct products such as meat and the indirect products such as the landscape itself, be valued, so that the management of the landscape by livestock farming can be achieved by a mixture of policy measures and economic factors?

These are complex questions. This paper will concentrate upon the second element, whilst the third question will be discussed in another paper in these proceedings (Ashworth *et al.*, 1999). Both of these papers will refer to preliminary results arising from asking people for their views upon landscapes. Table 1 provides some information on the study regions.

Table 1: The Study Regions

Country	Region	Characteristics
Germany	Rhön Biosphere Reserve, Central Germany	<ul style="list-style-type: none"> • 40% of area woodland • Meadows of high nature conservation value • Some peat covered moorlands
Greece	Pertouli, Pindus Mountains of Central Greece	<ul style="list-style-type: none"> • Lower valleys and lower slopes with mixed mosaics of fields and woods near to villages • Larger woodlands on higher slopes, with large open spaces for grazing • Sub-alpine meadows above tree-line
France	Luberon, Provence	<ul style="list-style-type: none"> • Valleys and lower slopes with mixed agriculture • Crests and plateau with woodland and shrubland
Italy	Matese Massif, Molise	<ul style="list-style-type: none"> • Upper mountains with copses and woods • Lower altitude valleys with open unenclosed meadows

Table 1 contd../.

Country	Region	Characteristics
Scotland	Loch Lomond, Dunbartonshire and Stirlingshire	<ul style="list-style-type: none"> • Land surrounding Britain's largest freshwater lake • Lowland sector with fields and low altitude moorland • Flanks of Loch Lomond where native woodland grades into open semi-natural moorlands – some large forestry plantations • Mountains and glens

Results and Discussion

Common elements within the landscapes

There are two possible alternatives in discussing the landscapes in these regions. The first is simply to decide whether they are unique to the region and country. The second approach is to seek to find common means of defining them and common elements within them. This latter approach is preferable, because it allows fairer comparisons between regions and countries and allows discussion of management and policy mechanisms for different sites.

Europe's agricultural landscapes have been classified in several ways. Meeus *et al.* (1990) describe 13 types of agricultural landscapes, whereas the Dobris Assessment (Stanners and Bordeau, 1996) classified landscapes into 30 types across an extended range using many of the Meeus *et al.* (*loc. cit.*) classes. These classifications use descriptions of the landscape using physical features that are a combination of topography and anthropogenic elements (such as enclosures). Table 2 shows the 13 categories of agricultural landscapes as described by Meeus *et al.* (1990). These are derived from three main classifications: enclosed or unenclosed plots; marine or mediterranean; and valley or mountain.

Table 2. Classifications and locations of main agricultural landscapes in Europe (from Meeus *et al.*, 1990)

Classification	Landscape Type and Location
Marine - enclosed	<i>Bocage</i> (western France, east of Ireland, western England, southern Scotland, north western Denmark, south eastern Norway and south western Sweden); <i>Semi-Bocage</i> (Massif Central of France, and Galicia in Spain); <i>Kampen</i> (Flanders in Belgium, Eastern Netherlands, Nordrheinland-Westfalen in Germany)
- unenclosed	<i>Open Field</i> (from Paris basin to middle of Germany); <i>Former Open Field</i> (south western England, eastern Denmark, southern Sweden); <i>Polder</i> (from west of Netherlands and Lower Saxony, Germany to south western Denmark)
Mediterranean - enclosed	<i>Cultura Promiscua</i> (central Italy); <i>Montado</i> (southern Portugal and dehesa of south western Spain)
- unenclosed	<i>Mediterranean Open Field</i> (Spanish highlands, mountainous regions of northern and southern Italy, Greece); <i>Huerta</i> (along Mediterranean coast)
Other - mountains	<i>Highlands</i> (western Ireland, north western Scotland, Norway); <i>Montagnes</i> (Alps and Pyrenees)
- deltas	<i>Deltas</i> (Taag in Portugal, Guadalquiver and Ebro in Spain, Po in Italy, Thessaloniki plain in Greece, Gironde and Rhone in France)

The study regions include marine and mediterranean landscapes and both enclosed and unenclosed lands and mountain landscapes. In a first attempt to distil down the considerable local heterogeneity with in each study region, Waterhouse *et al.* (1999) concluded that there were common elements between a number of these regions. All included field systems divided by hedges (*bocage* or *semi-bocage*) and all had unenclosed land, some of which was woodland

Important factors that influence the impact of livestock are:

- Animal species, age, production level, previous dietary experience;
- Shepherding management – grazed within fields, free-ranging or moved by shepherds – will influence both where the animal is and what it selects for its diet;
- Supplementary feeding and watering methods and location;
- Seasonal timing of access;
- Intensity of access as indicated by stocking rates and offtake rates;
- Dynamics of vegetation within the landscape, especially the vigour of regeneration of tree and shrub species.

A prime issue in all study areas is the grazing and browsing of seedling trees, shrubs and trees. In the Scottish study area two issues arise. On higher altitude pastures, dwarf shrub heath, heather moorland, is considered by some (e.g. Wildlife Trusts, 1997) to be under threat from too high a level of grazing. Though not common in the study area, heather moorland is burnt regularly to maintain young plants with grass available to sheep and to prevent succession to woodland and under heavy grazing its growth and development is suppressed (MacDonald *et al.*, 1998). At medium-level altitudes woodland regeneration in birch and oak woodlands is prevented by grazing and browsing by sheep (and other grazers, such as deer) This combination of 'tooth and fire have proved invincible' in shaping the landscape of the highlands of Scotland (Darling, 1955). As sheep have access to these areas on an annual basis, but nutritional value of grassland and its availability differs considerably, there are seasonal impacts of grazing. Winter is the period of greatest consumption of woody plants (Mitchell and Kirby, 1990). By contrast, in southern Europe, woody plants are of most value nutritionally in summer months in the Mediterranean pastures owing to the hot climate. In higher mountain areas, with cooler and wetter climate, grasslands maintain their grazing value throughout the year. Nevertheless, there may still be problems of overgrazing as seen within the Italian study region, Matese. Elsewhere, undergrazing is more likely to be a problem, with coarse grasses becoming dominant in sub-alpine and alpine pastures that have low levels of grazing offtake.

However, it is in the areas where succession is aggressive towards woodland that many problems are occurring. In the German and French study regions scrub and full woodland is becoming dominant in areas previously used for, and maintained open by, livestock grazing. Within the Greek study region, areas near farmers buildings are heavily overgrazed, whereas areas further away are undergrazed and scrub encroachment is occurring. The reduction in numbers of livestock is considered to be part of the reason for these changes to landscape. However, changes in the whole system are considered to be equally important. It is concluded that simply encouraging more livestock will not solve any concerns over undergrazing. Rather, any schemes must consider the way that grazing of the managed areas fit within the whole farming system. Factors that have influenced a change in management system are:

- Changes in the social structure and the reduction in shepherds – especially young shepherds
- Changes to more intensive systems – especially for fattening lambs and kids that require more concentrate feeds;
- Once pastures become invaded with scrub they become less attractive to shepherds for use by their flocks and grazing preferences may change;
- Changes in breeds that are less suitable for grazing extensively;

In addition to the impact of livestock systems upon landscape, the landscape can have direct impacts upon livestock system. Small woods, shelter belts, hedges and walls all provide livestock benefit through shelter (Hislop and Palmer 1999), although large woodlands do not bestow shelter

benefits on livestock next to them. However, woodlands and other features provides a haven for large and small pests, from wolves and dogs down to flies. At the finer scale, elements of the landscape can negatively impact upon livestock, for example by vegetation becoming caught within the wool of sheep. Some vegetation with high landscape impact can be harmful through their toxicity, for example bracken and rhododendron (which has become a feature of the Scottish uplands after escaping from gardens). In bocage systems, hedges and small copses provide field boundaries which allow improved management of livestock and conservation of fodder or crops to be grown.

What do people want?

As noted in Ashworth *et al* (1999), there are considerable difficulties here. When questioned using open participative methods, most members of the public in the study areas used landscape terms (e.g. forest, field, hills) to describe the areas. However, most did not appreciate the impact of farming. In a questionnaire relating to local distinctiveness of animal products from areas with well-known landscapes, some 76% of respondents did not know which animals were found within the Loch Lomond area (Ashworth *et al.*, 1999), despite it being one of the most well-known and most accessible rural tourist areas in Scotland. Given this lack of knowledge, it would be difficult to appreciate the complex relationships between sheep farming and native woodlands and commercial forestry to create the current landscape of open land, native oak and birch woodlands and forestry plantation found around most of the central and northern shores of Loch Lomond.

Other studies have attempted to determine the views of the public in terms of what they want (Bullock, 1995) and have further attempted to put financial values on landscape. A next stage of our project is to complete a set of surveys in each country which seeks to ask farmers, tourism providers (hotel, B&B, tour operators) and the public (both tourists and the general public) to glean further the understanding and the views of people who are involved in the landscape of these areas.

Achievement of policy objectives

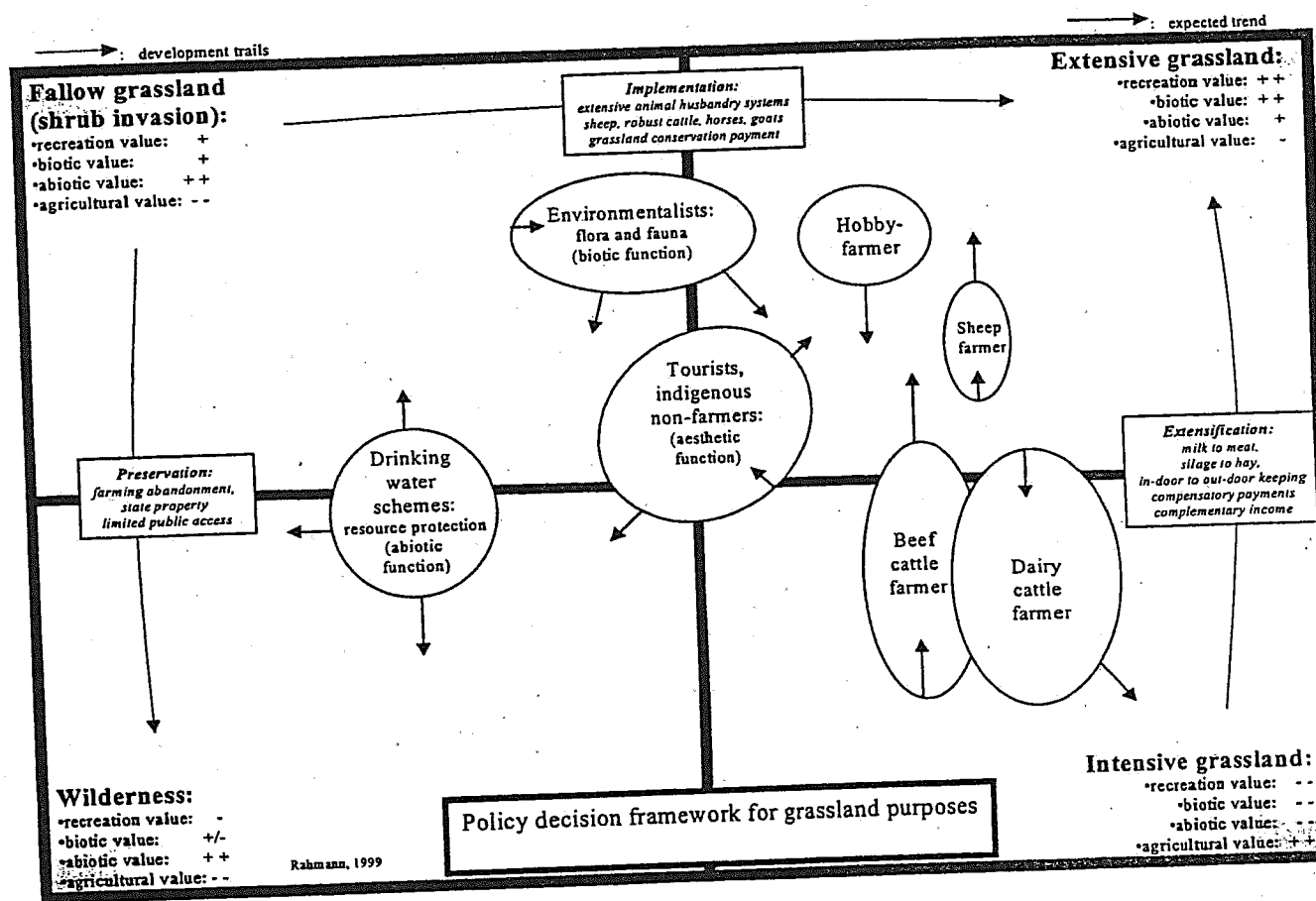
Theoretically, once it is known what the 'people' want, it is then possible to determine whether these objectives can be met. It is clear from our preliminary work, that different people want different things and that there are large differences between the countries in the knowledge and views and landscape and the countryside. At the present time, policy is set at local, regional, national and EU level, taking into account a wide range of factors.

These policies tend to work at different scales, compatible with that at which the livestock themselves impact on the environment. Firstly, there is policy that influences the presence of farming and of particular enterprises at the wider scale. Secondly, there is policy that influences the intensity of management at the farm/field scale. For example, regeneration of heather moorland through manipulation of stocking rates is an objective of the Environmentally Sensitive Area Scheme in Loch Lomond (SOAFD, 1992). Thirdly, at the finer scale, more specific objectives are set. These may involve the planting of hedges (in Britain) or the removal of invading bushes with machines (in Germany). In France, the schemes under the Agri-environnement package (EC 2078) include those that aim to reduce shrub invasion via individual contracts with farmers, using flocks of browsing sheep as a tool. One major conclusion of our project to date is to recognise that even when using the animal as a tool to achieve fine-scale impacts, knowledge of the whole system is necessary to ensure that the objective can be achieved. For example, without knowledge of system preferred by farmers, it is difficult to produce a successful system to graze woodlands for different months of the year. In this case, the scheme has to be attractive to farmers and have little negative impact upon his production to be cost-effective for both farmer and tax-payer.

The role of whole systems in achieving landscape objectives is provided by the following example from the Rhön Biosphere Reserve where invasion by shrub woodland from field boundaries is occurring rapidly owing to reduced grazing. The case is made by the German members of our team that merely seeking to pay farmers to use livestock to clear or prevent further invasion is not necessarily workable, unless the animals are present, the species is correct for the job and the job of shrub clearing fits within the farming and economic objectives of the farmer. Different approaches will lead to different outcomes as depicted in Figure 1.

This example demonstrates that certain objectives are not only better achieved by sheep than by cattle, but that dairy farming will have a different impact from beef production. Thus, the whole farming system need to be aligned with whole policy framework which needs to take into account the impact of the animals and the system at all scales.

Figure 1: Meadow management in the Rhön Biosphere Reserve



Conclusions

Landscapes in hilly LFAs are important. Though they are very different across different regions of Europe, there are common features which can allow the landscapes to be classified using common methodology. However, the way that livestock and their keepers use the areas differs in terms of animals, seasonality of use and in management practices such as shepherding versus free-ranging. Areas which require special management are likely to be only part of the land used by the husbandry system, and successful management is likely to require understanding and involvement of the full livestock system. Furthermore, achievement of objectives, especially multiple objectives, are likely to require tailoring of agri-environment schemes to meet local contexts but a set of common tools (such as appropriate grazing management) may be useful.

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