

THE RELATIONSHIP BETWEEN LIVESTOCK SYSTEMS AND REGIONAL LANDSCAPES IN LESS FAVOURED AREAS OF EUROPE - USING LOCH LOMOND IN SCOTLAND AS AN EXAMPLE.

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Summary

The agricultural landscapes of Europe are diverse and have complex interactions with livestock systems, especially in the less favoured areas. Attempts by other authors to define a small number of major regional landscape types have been made. The Loch Lomond study region in Scotland has been used as a pilot to condense the considerable diversity within this landscape into the two relevant regional landscapes that have been defined for the region; Northern Highlands and Atlantic Bocage. Key interactions between livestock systems and these major landscape types have been produced. Similar exercises have been carried out for other study regions to categorise the study areas into simplified agricultural landscapes. Certain types are common to more than one study region. Whilst such an approach loses much of the distinctiveness of the local landscape character it does allow discussion about common themes in the interactions between livestock systems and landscapes across Europe. Moreover, the simple regional landscape types appear to be good predictors of animal production system and more detailed characterisation may not be essential to understand the relationship between livestock production and landscape at the European scale.

Introduction

Europe contains a wide variety of landscapes. Five regions across Europe in Scotland, France, Italy, Germany and Greece have been studied. There are considerable differences between these study regions but they are all heavily influenced by livestock production systems. These systems are themselves heavily influenced by policies and markets within the European Union.

In terms of their landscapes, one approach is to conclude that these regions are all very different due to differences in culture, history, topography, soils and climate. As an alternative approach, the main thrust of this paper is to investigate whether there are common, simplifying, elements in these apparently highly different landscapes and then to discover whether the impacts of the animal husbandry systems can be better understood by using common and contrasting themes within the landscapes.

The impacts of animal husbandry systems upon landscapes are complex. It is widely recognised that such impacts occur through both direct and indirect means (Ashworth *et al.*, 1997, Fuller 1996). For example there may be direct impact of grazing and browsing animals upon trees and shrubs. An indirect result of animal-keeping is the creation, and then maintenance, of field boundaries to control, enclose or exclude livestock. It is also widely recognised that the scale of both direct and

indirect impact differs very dramatically in both free ranging and herded flocks of ruminants (Milne, 1996). The impact can be at the very small scale (e.g. the impact on the bush at the plant scale) or at the wider landscape scale (e.g. influencing a whole forest appearance over many years at the landscape scale).

Landscape Classification

Europe's agricultural landscapes have been classified in several ways. Meeus *et al.* (1990) describes 13 types of agricultural landscapes, whilst the Dobris Assessment (Stanners and Bordeau, 1996) classified landscapes into 30 types across an extended range using many of the Meeus (*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 1 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.

Figure 1 shows a simplified map of these 13 agricultural landscapes reproduced from Meeus *et al.* (1990). The 30 landscape classifications described by Stanners and Bordeau (1996) apparently provide a wider range of landscapes. However, many of these are 'natural'

landscapes such as tundra and forest. Otherwise, the modified landscapes are based largely on those described by Meeus *et al.* (1990), except the inclusion of woodlands and forest plantations as classes of landscape. This is highly relevant for the project study regions, because of the considerable importance of trees and scrub woodland

in the interaction between livestock and the landscape. One problem though is to determine when a wood is a separate class and when it is merely an element within another landscape such as bocage or montagnes landscapes.

Table 1: Classifications and locations of main agricultural landscapes in Europe (from Meeus *et al.*, 1990)

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

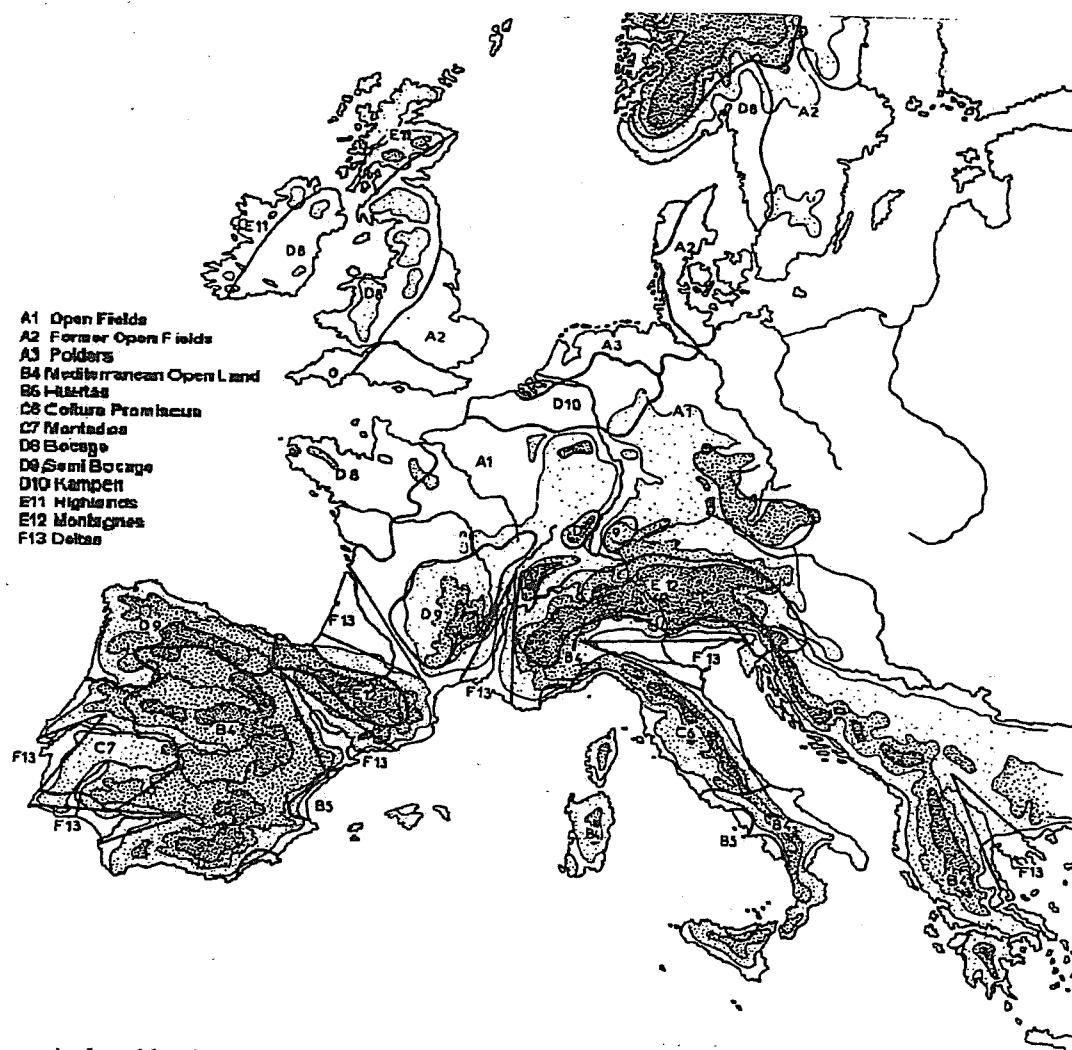


Figure 1: The agricultural landscapes of Europe (from Meeus *et al.*, 1990)

There are problems using such classifications. Farming systems are influenced by the physical geography but are also affected by cultural factors, historical events and land ownership systems which in turn affect the landscape. Meeus *et al.* (1990) admitted that the characterisation of European agricultural landscapes into 13 (or even 30) broad categories does not fully expose national and regional variation.

Classifying complex local landscapes into regional landscapes classes - The Loch Lomond Study region

The next section will attempt to fit the complex local landscapes from one of the study regions, Loch Lomond in Scotland, within these broad landscape classifications. The landscape of the Loch Lomond region has been classified into 18 categories using a unique, site based system (Land Use Consultants, 1993). A map showing the distribution of these landscape character areas is shown in Figure 2. These classes take into account the local topography and vegetation cover.

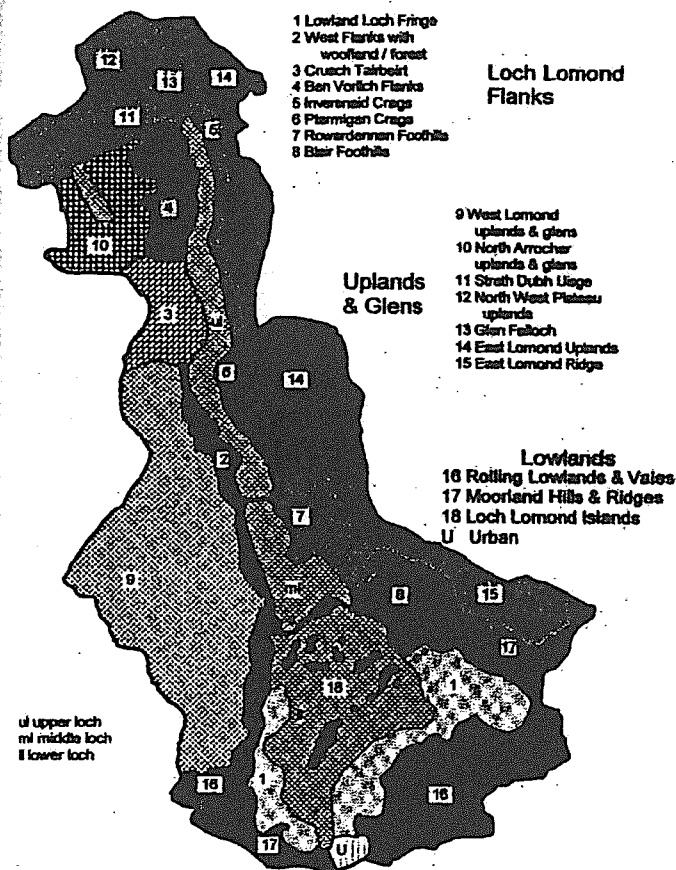
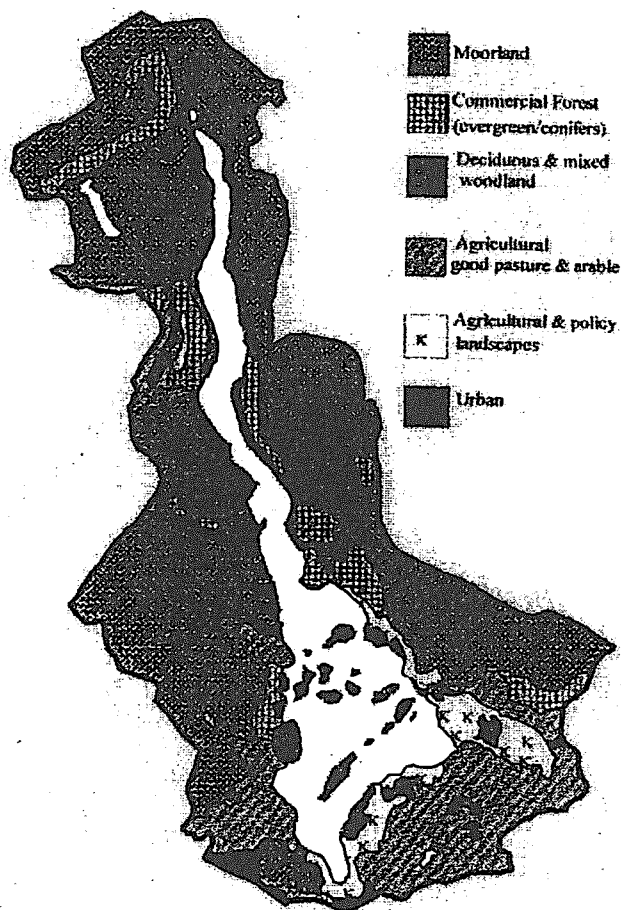


Figure 2: Landscape Character Map of Loch Lomond Study Area (Land Use Consultants, 1993)

When compared with main agricultural vegetation cover map of the Loch Lomond region (Figure 3) it can be seen that the landscape classification appears to provide finer detail. For example, the moorland (a single vegetation cover) consists of about 12 different landscape categories in Figure 2. However, the titles of the landscape classification types do not themselves provide identification of the agricultural vegetation cover or land use. Neither does the map of vegetation cover directly describe the livestock systems that exist in the Loch Lomond region. For example, the class of agricultural good pasture and arable land describes land that may be used by grassland for grazing of sheep, beef cattle or dairy cows or a variety of crops ranging from brassica roots crops for use by livestock or cereals.



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Figure 3: Main Vegetation Cover types in Loch Lomond (Land Use Consultants, 1993)

Figure 4 shows how the landscape assessment types of the Loch Lomond region may be allocated to the regional agricultural landscapes described commonly by both Meeus *et al.* (1990) and Stanners and Bordeau (1995). This has been achieved by scaling up the landscape character types to the agricultural land uses and then applying these to the regional agricultural landscapes. It can be seen that the scaling up loses the detail and diversity of landscapes. A number of the local landscape character areas each contain different vegetation cover that are themselves more indicative of different European landscapes. However, by choosing only the most dominant characteristics, 18 landscape categories are condensed down to two regional agricultural landscapes, viz. northern highlands and atlantic bocage.

The split between the two regional landscapes appears on the map of Europe (see Figure 1). However, this simplification tends to lose much of the character of the area. The Highland area contains, amongst it, large blocks of coniferous woodland (more characteristic of the Montagnes landscape of central European

mountains), but has also blocks of bocage and semi-bocage in the fields on lower altitude. The semi-natural woodlands, which are highly characteristic of the area, sets the Highland landscape in Loch Lomond apart from the same landscape class in the rest of Scotland and western Ireland.

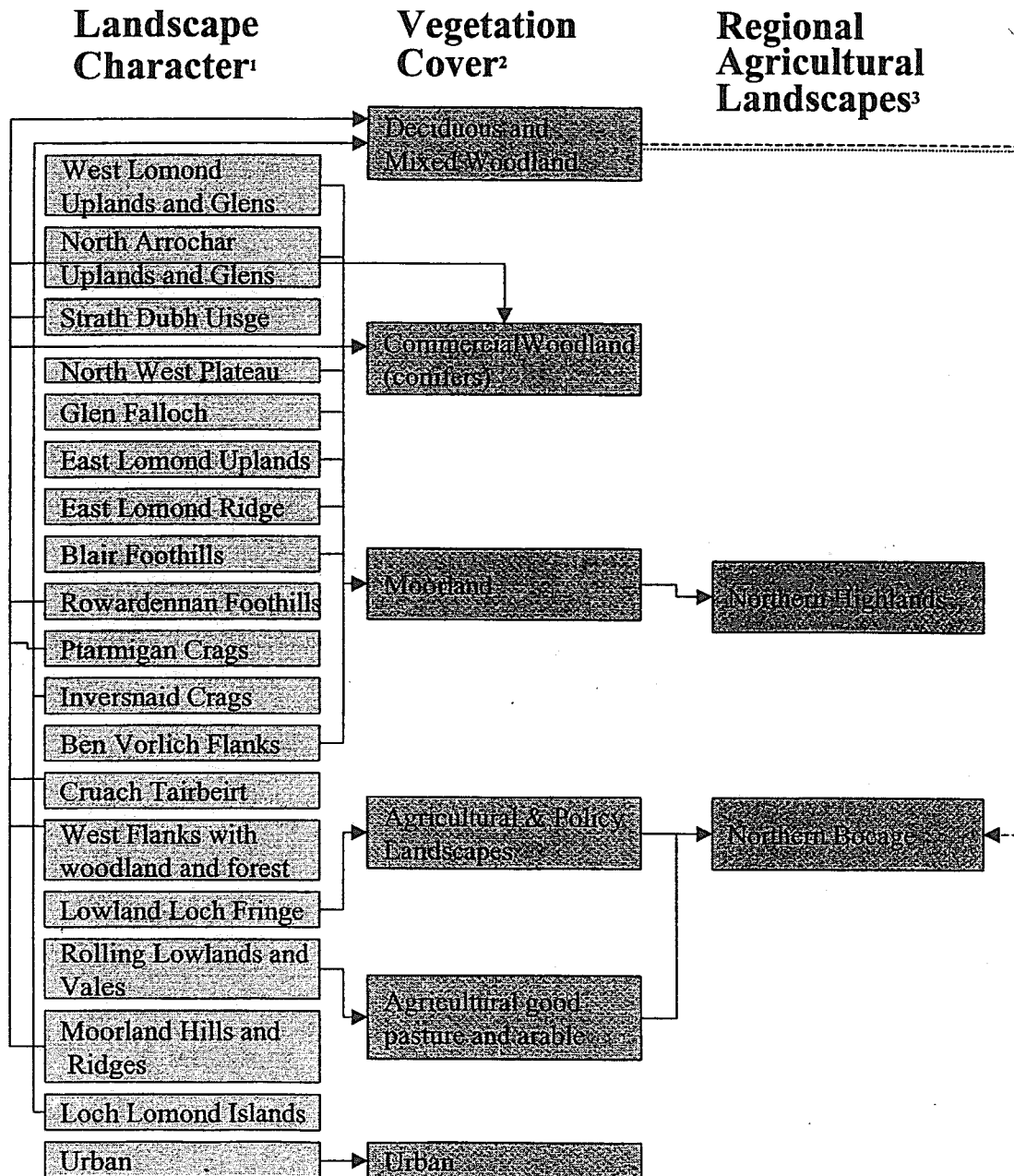


Figure 4: Different classifications of landscape (^{1,2} Landscape Consultants, ³ Stanners and Bordeau, 1995)

The two regional landscape types appear to be as indicative of the main agricultural land uses as either of the two more detailed classifications. Hill sheep production is the dominant agricultural system in the parishes described by the Highland landscape and combinations of upland sheep, beef cattle and dairy cattle of those in the bocage areas (Topp, 1999).

Livestock Systems and the Landscapes of the study areas

A similar approach may be possible for each of the study areas. Table 2 shows how each of the study regions includes a range of even the very broad agricultural landscapes as described by Stanners and Bordeau (1995). Indeed there are similar landscape classes common to more than one study area. Are these

landscapes used in the same way?

Table-2: Landscape classification of LFA study region and the related livestock systems

	Landscape	Loch Lomond (Scotland)	Pertouli (Greece)	Rhon (Germany)	Luberon (France)	Matese (Italy)
Tundra	Tundra					
Taiga	Taiga					
Uplands	Northern Highlands	Hill sheep		None		
	Mountains (<i>montagnes</i>)		Sheep and cattle in summer			Sheep, cattle and horses in summer
Bocages and Enclosed Landscapes	Atlantic bocage	Dairy, beef and lowland sheep				
	Semi-bocage		Sheep and goats			
	Mediterranean semi-bocage				sheep	
Artificial landscapes	Polder					
	Delta					
	Huerta					
Regional landscapes	Kampen			sheep		
	Polish strip fields					
	Coltura promiscua					
	Dehesa and montado					
Openfields	Atlantic openfields					
	Continental openfields			sheep		
	Aquitaine openfields					
	Former openfields					
	Central collective openfields					
	Mediterranean openland				Sheep in summer	Sheep, cattle and horses in summer
Steppic and arid	Steppe					
Woodlands	Coniferous woodland	None				None
	Broadleaved woodland	Sheep and beef cattle				None
	Scrub woodland	Sheep			Sheep	

None – landscape present but not currently used by livestock

Interactions between Livestock Systems and Classified Regional Landscapes Classes

As described earlier, the Northern Highland landscape is associated with hill sheep farms while the Bocage landscape systems are characterised by dairy, beef and lowland sheep systems. Hill sheep farms may contain some fields and blocks of conifers (not used by stock) and native woodlands (frequently grazed by stock). The interactions between the livestock systems and landscape features are described below.

Northern Highland landscapes

- Sheep at moderate to high stocking rates, especially in winter, maintain an open landscape preventing the regeneration of trees (Mitchell and Kirby, 1990).
- Light grazing intensity in grass and dwarf shrub plant communities increases the number of species but heavy grazing intensity can reduce landscape diversity and biodiversity (Milne, 1996). Heavy grazing particularly affects the landscape, reducing *Calluna vulgaris* (McDonald *et al.*, 1998), a plant of considerable landscape and cultural importance to Scotland.
- In some systems, stock fences are used. These may have

a visual impact on the landscape, both directly and through sharp geometric changes in vegetation if there have been long term grazing influences.

- Vehicle tracks built specifically for animal husbandry systems are uncommon, but have a visual impact on the landscape.
- Trampling, especially by cattle, increases biodiversity in landscape and reduces the spread of bracken which may dominate landscape in areas of more fertile soils.
- Different cattle breeds are utilised by farmers in different ways. Hardy breeds tend to graze higher altitude pasture. There may be breed differences in grazing and trampling behaviour, but there is little direct evidence for this (Bullock and Oates 1997).
- Heavy grazing may increase the rate of soil erosion, particularly on steep slopes, by watercourses and in areas around supplementary feeding points. Supplementary feeding method influences grazing behaviour and location (Waterhouse, 1997).
- Recent livestock housing has been built using modern materials.

Atlantic Bocage landscapes

- Field boundaries such as walls and hedges are important to control livestock. Fences may replace some of these and unmanaged hedges develop into rows of trees. But in more intensively managed systems, some field boundaries may be removed to increase the size of parcels to improve ease of use by machinery.
- Grazing maintains diverse species rich grassland, flowering of which has seasonal landscape impacts.
- Woodland regeneration may occur within the hedges and in planted areas but is generally prevented in intensively grazed systems.
- Drainage of fields affects the landscape by a change from mire vegetation to grassland species. Cessation of maintenance with less intensive farming leads to increased waterlogging of fields with changes of vegetation, including increased invasion with rushes (*Juncus spp.*).
- Inorganic fertiliser application, silage cutting and reseeding practices all affect the landscape, decreasing diversity, particularly of herbs and flowering plants.
- Diffuse watercourse pollution from run-off from fields alters the landscape downstream and at loch entrances, increasing algal growth.

Discussion and conclusions

Regional landscape typologies are useful but are difficult to apply, as landscapes are extremely diverse and do not consist of large homogeneous areas. Different husbandry systems use different landscapes. This varies between LFA regions. The livestock systems develop due to the landscape type, but are affected by other factors not included in the landscape classifications used, such as technology, policy, markets, and cultural development. The small number of regional landscape types found in each study region appear to be good predictors of livestock system. Husbandry systems have a variety of impacts on the landscape. These vary between LFA regions. Similar landscapes, which may be classified together under one agricultural landscape classification, may have different problems and issues. This is an important consideration for policy development.

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