Recognising European pastoral farming systems and understanding their ecology:
a necessity for appropriate conservation and rural development policies

Proceedings of the Seventh European Forum on Nature Conservation and Pastoralism

17 – 21 June 2000
Ennistymon,
County Clare, Ireland

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The seventh meeting of the Forum was organised by the European Forum on Nature Conservation and Pastoralism with the Heritage Council of Ireland.

In addition to the support and help of the Heritage Council, the European Forum on Nature Conservation and Pastoralism would like to acknowledge the contributions of the following organisations for this conference or for its work generally this year including the conference:

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Preface

These Proceedings bring together introductory material prepared for the conference, including background, purpose, papers, agenda and participants. In the case of papers and posters, authors were given the opportunity to supply full versions if they wished. Those received have been included. Otherwise abstracts have been used where we have these.

We have retained the structure of the conference. This is reflected in the relevant section of the programme reproduced at the start of each section. Asterisks have been added to indicate those items for which some material is available and included. Those posters for which material has been received have been included in the most appropriate section. Similarly, relevant material from the conference booklet has also been included.

The main purpose of these Proceedings is to make available the conference material to the many people (including both those participating and those who could not) who requested this. The Proceedings do not include a report on the main outcomes of the discussions at the conference. This is being published at around the same time (early 2001) in the Forum's newsletter *La Cañada* number 13.

Background to the 7th Forum on Nature Conservation and Pastoralism

The philosophy of the Forum is essentially to provide a place or occasion for debate, and to try and focus that debate on some of the topical issues affecting nature conservation in pastoral landscapes. Over the years it has become clear that there is great value in involving in that debate individuals from a cross-section of backgrounds – farmers, advisors, policy makers, ecologists and economists. In addition meeting "real" farmers and land managers in "real" places to discuss policies that have often been drafted in "virtual reality", has always proved to have benefits which far outweighed the expectations. Farming across Europe is undergoing unprecedented change; away from a production driven industry to one with broader-based environmental and social objectives; but it is far from clear whether new policies will actually have the desired effect, especially in biological terms. Ironically, it is often in the farming systems with highest biodiversity that it is most difficult to develop and implement specific environmental policies, because the functional relationships between agricultural production and wildlife are so intricately linked.

The organisation of the conference and the aims

The programme was structured to build on the successful elements of recent Forum meetings, putting emphasis on discussion and practical fieldwork linked to the presentation of thematic papers. Central to the conference was the working field visits (that gave a unique opportunity to investigate on the ground the impact of policy, social and market forces on a range of livestock farms) and the workshops in which specific themes was used to focus attention on key issues. The presentations in the plenary sessions were designed to complement the farm visits and the workshops.

For the Forum this meeting also provided the opportunity to get input on the potential for a pan-European research project to produce a typology of European livestock systems for environmental purposes. The Forum believes that this is long overdue, yet fundamental to understanding the functional relationships between farming practices and nature conservation value; and a prerequisite for the development of practical, well-targeted rural policy measures.

Why the Burren?

The internationally important karst limestone region of the Burren is an area where pastoral farming has played a pivotal role in shaping the cultural landscape that we see today. Farming systems developed out of a necessity to produce agricultural products by optimising the potential of the land. Today, like many of the more extensively farmed areas of Europe, agriculture is in decline under the pressures of global economics and European agriculture policy – despite the potential for sustainable management. At the same time agri-environmental policies that aim to maintain or restore some of the features of the former agricultural systems are on the increase. The Burren was used as the setting within which to consider this contradiction in a practical way, as well as some of the topical European environmental issues associated with Agenda 2000. These include cross-compliance, good agricultural practice, agri-environmental measures, area-based payments in the LFA (and the potential for these in the livestock sectors) and the developing concept of integrated rural development. The range of livestock farming and farm enterprises and the high biological and cultural value of the Burren offered an excellent case study area to look at what these measures mean on the ground for individual farmers and for critical review.

The farm visits

For the fieldwork the conference was be divided into three or four groups each with delegates from a range of different backgrounds and at least two or three facilitators. The groups were provided with field-sheets and questionnaires with the aim of actually collecting information from the field. Whilst the farmers and facilitators were well able to answer questions, the groups were requested to ask themselves questions about how their conceptual ideas (for example for diversification, environmental management, cross-compliance) related to the farm in question. The farms are not demonstration farms – they are working farms that will feel the full force of EU and national policy changes.

The workshops

The workshops used the information collected in the field, to look in more detail, and in a wider European context, at how regionally distinctive farming systems and their environment are being or will be influenced by policy, market and social pressures and to identify key issues. They also tried to identify solutions to the current problems.

The plenary sessions

Formal papers were presented in two plenary sessions. They aimed to link the specific issues of the farming systems in and around the Burren with broader issues

and other areas of Europe. Presentations were grouped under two headings:

A European perspective on agriculture policies, nature conservation and livestock systems

Here the aim was to broaden the geographical view and to look at some of the new CAP measures and their potential effects on European livestock systems, putting what was seen in the field into a wider context.

Linking ecological science, farmland biodiversity and environmental practice

This explored how much is actually understood about the ecology of farming systems and, by looking at examples, explored whether well-developed ecological theories and models actually inform agri-environmental and conservation management.

From a policy perspective these were important sessions because they addressed issues that are fundamental to the longer-term development of measures such as environmental cross-compliance or the practicalities of rewarding or encouraging environmental enhancement.

Pan-European Research Project: a typology of livestock systems for environmental purposes

This session provided an opportunity for a guided discussion on the need for and the practicalities of this proposed research. The Conference offered an excellent opportunity for agreeing the next steps for the elaboration of the work and to identify potential partners.

The outcomes anticipated

Rather than producing the usual conference proceedings, it was anticipated that the fieldwork reports and workshop discussions would be used as the chapters of a discussion document, with the papers and poster papers in an annex. This has been implemented by *La Cañada* 13 and these *Proceedings* (see Preface).

Acknowledgements

In addition to the support and help of the Heritage Council, the European Forum on Nature Conservation and Pastoralism would like to acknowledge the contributions of the following organisations for this conference or for its work generally this year including the conference:

European Commission
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English Nature
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National University of Ireland, Galway.

The Forum would like to thank the Council, the Chief Executive and staff of the Heritage Council for their enthusiasm and hard work. Their contribution was led by staff members Liam Lysaght, Martina Malone and Liam Scott, together with Micheline Sheehy Skeffington (NUI Galway), Member of the Heritage Council & Chair of the Standing Committee on Wildlife.

Forum personnel particularly involved in the planning and organisation of the conference included David Baldock, Eric Bignal, Gwyn Jones, Davy McCracken, Mike Pienkowski and Natacha Yellachich.

The conference organisers are particularly grateful to the farmers and other local residents who hosted the key farm visits and joined so valuably in our indoor sessions too. The staff of Falls Hotel, the other restaurants visited and the range of cultural teams who entertained us added greatly to the positive and productive atmosphere – as did the many participants who contributed in many ways from Freisian folk-singing, through the most over-qualified team of volunteer slide-projectionists yet, to those contributing papers and posters, leading discussions or field visits or contributing to discussions.

Finally, we should pay tribute to those who helped the conference overcome the disadvantage of having its arrival day coincide with the disruption caused by computer failure in UK air-traffic control. The local organising staff worked through much of the night gathering in late arrivals, as did the owner of the local coach company. Full marks to the delegate who managed to persuade the airline to allow him to travel on an unscheduled positioning flight from Dublin to Shannon of a trans-Atlantic jet! And commiserations to the delegate from the Channel Islands, from where all flights were rather unfairly cancelled for several days to make space at UK airports for delayed flights from elsewhere. The efforts of all are appreciated; the meeting seems to have been worth the struggles.

Section 2

Items marked * are included as summaries or full texts in this section.

Saturday 17th June

19.00 onwards Buffet dinner (to allow for late arrivals)
20.00 Reception and official opening of the Conference by Ms Sile DeValera, Minister for Arts, Heritage, Gaeltacht and the Islands

Sunday 18th June

SESSION 1: Introduction to the conference and the Burren region of County Clare

Chair: *Michael Starrett, Chief Executive, Heritage Council*

09.00 Introduction to the 7th Forum and an outline of the aims of the meeting.
*Mike Pienkowski **
[Notes for the field visits, and linking to the workshops *from the conference booklet* *]
[Introduction to Ireland *from the conference booklet* *]
[Introduction to the Burren, *Micheline Sheehy Skeffington & Mike Gormally, from conference booklet* *]
09.15 The Burren, its farming and wildlife
*Ute Bohnsack, Ireland **
09.50 Logistics of the field visits and their link with the workshops.
Liam Lysaght, Ireland

SESSION 2: Farm visits – investigating the effects of policy on the ground

See Appendix 1

10.10 Leave in groups by small coaches (taking packed lunch).
11.00 Guided by facilitators and the farmers, and using questionnaires provided, gather information on the farming systems and their future development with specific reference to agriculture policy and the four workshop topics.
16.30 Conference reassembles at the Burren National Park for a combined discussion and review of the first day's fieldwork.
18.30 Leave for dinner at Carron.
Late Return to Hotel

European Forum on Nature Conservation and Pastoralism

Details of the objectives, activities, publications and other information about the Forum are available on its web-site (www.efncp.org). Some aspects highlighted at the meeting are noted below.

Aims of the European Forum on Nature Conservation and Pastoralism

- To increase understanding about which European farming systems are of high nature conservation and cultural value.
- To ensure the availability, dissemination and exchange of supporting information combining research and practical expertise.
- To bring together ecologists, nature conservation managers, farmers and policy makers to consider problems faced by these systems and potential solutions.
- To develop and promote policy options which ensure the ecological maintenance and development of these farming systems and cultural landscapes.

Current work areas

Management

1. Administration and management of the organisation

Networking

2. Maintenance and utilisation of the network: representation and dissemination
3. Organisation and holding of the 2000 main meeting of the Forum

Research

4. Further development of review of high-nature-value farming systems in the EU, and how Member States are addressing their maintenance

Dissemination

5. Producing the EFNCP's newsletter *La Cañada*
6. Work in support of European Commission initiatives, including the EU Biodiversity Strategy, DG Agriculture Consultative Committees, and seminar series for policy-developers and decision-makers
7. Dissemination of the message to wider audiences

Current participation

Circulation of *La Cañada*: 57 countries

Participation in Luhacovice conference 1998: 22 countries

Participation in Ennistymon conference 2000: 29 countries

Advisory Board: 18 countries

Financial support for Forum: 3 countries (plus matching from European Commission)

Wider financial support, matching more closely the spread of users would be welcome.

Future participation

In order to help people who would like to become more involved in the work of the Forum, several informal working groups, which are likely to operate mainly by e-mail, are being established by the Forum. The groups and their co-ordinators are:
Scientific & policy research - Davy McCracken
Network development –Natacha Yellachich
Conferences & seminars – Colin Hindmarch

Future conferences – requirements

One way of helping future developments is in identifying groups which would like to host future Forum meetings. Some of the key requirements are listed below, and more information is available from the contacts above.

1. Conference room for 100-120 (plus box for interpreters if appropriate); at least 2-3 other rooms for working groups; area for displays/ coffee etc.

2. Enough accommodation (at < Euro 60 per night) at, or within walking distance, of meeting rooms.

3. Appropriate location for a consideration of nature conservation and low-intensity agriculture.

4. The field trip is to be integral to the programme.

5. The meeting should probably last about 3 – 3.5 days including the field visit.

6. The programme will be developed by the Forum in consultation with the local organisers.

7. The prospective hosts must accompany their proposal with an estimate of the likely costs arising in the host country, and of any likely financial contribution to these that the hosts may be able to raise. (The Forum will advise on central costs.)

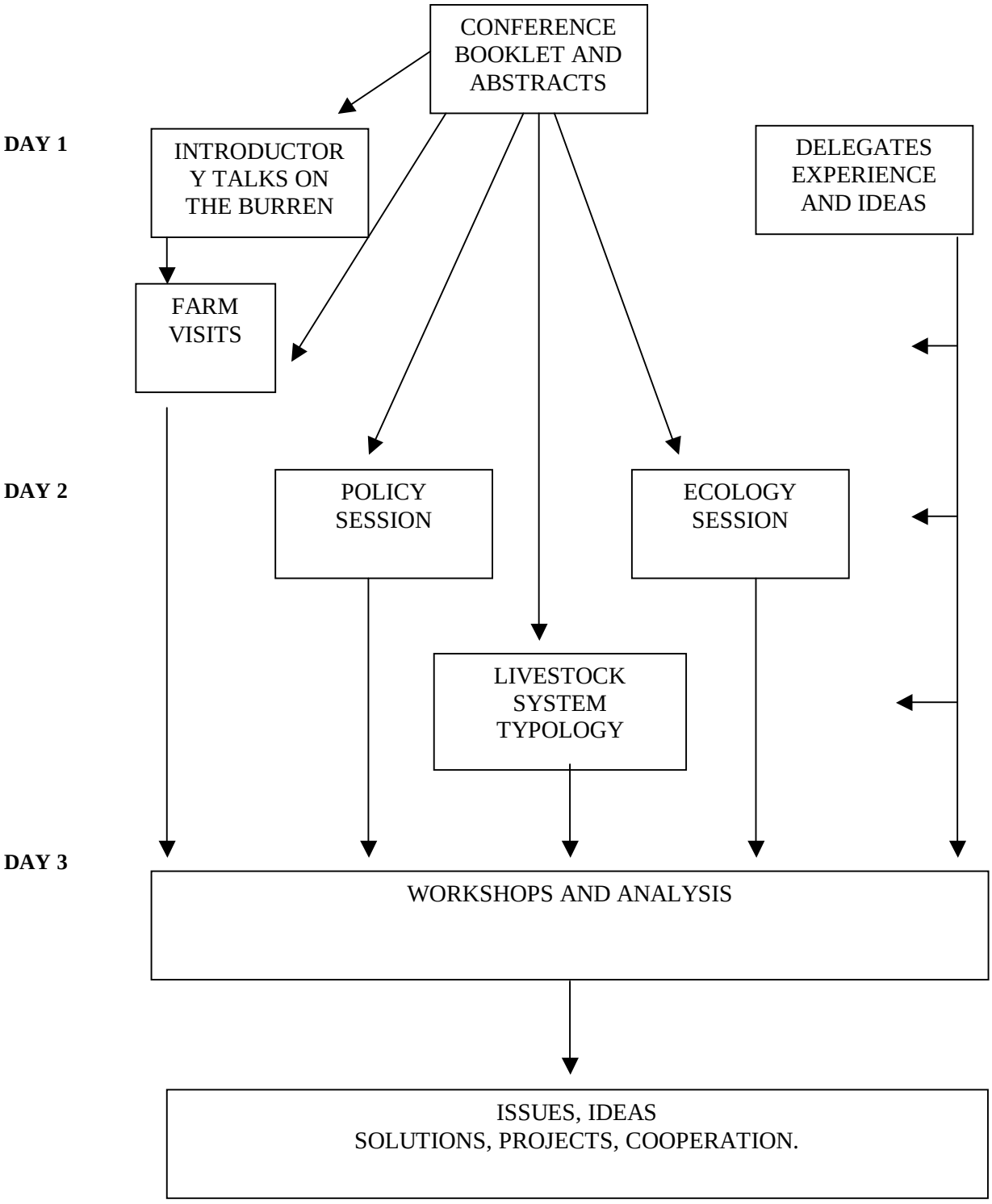
8. The arrangements should be completed and published a year ahead of the meeting. Therefore, initial bids to host the meeting should be received by the end of September 2000.

Notes for the field visits, and linking to the workshops

This section reproduces the guidance notes for participants in the field and later indoor workshops.

Central to the success of the Forum meeting will be making the link between the different elements of the conference, and drawing these together to inform the discussions at the workshops. The outcomes from the workshops will then be synthesised to produce recommendations on how to proceed. A schematic diagram showing the relationship between the difference components is shown below:

RECOGNISING EUROPEAN PASTORAL FARMING SYSTEMS AND UNDERSTANDING THEIR ECOLOGY



In essence the four questions running through the entire Forum should be:

- What are the farmers doing on their farms and why (motivation and drivers)?
- What effect is this system having on the environmental interest of the area?
- Is current agricultural and/or agri-environment support having benefits for environmental interest?
- If not why not and what could be done about it?

To facilitate the collection of information in the field visits, attention will be focussed on four topics, which will link with the workshops outlined below.

The four topics are:
A. Factors affecting choice of type of production system,
B. Ecological value and effectiveness of agri-environment approaches taken on farms,
C. Rural development opportunities and constraints
D. Production systems in operation

Each group will, with the aid of the farmers and the facilitators, consider the relevance of these four topics to each of the farms visited.

Workshops

A. Mainstream agricultural support and opportunities for environmental enhancement
First part of workshop to compare and contrast the different management of the farms visited in light of what the main sources of income are and what are the main influences on the farming system (e.g. if part-time, what effect does that have on types of livestock kept etc.) and hence implications for trying to maintain or change this through changes in support mechanisms.

This should include a discussion on opportunities provided by cross-compliance, modulation, national envelopes, structural support and extensification.

Remainder of the workshop to consider the wider relevance of the findings from the Irish farms visited, and compare and contrast different approaches taken throughout Europe, in terms of (a) other approaches or changes to current that could be of use in Ireland and (b) lessons to be learned from other areas of Europe and (c) how different approaches might be more appropriate for different categories of farm and farmer (e.g. full time versus part time).

Conclusions and policy implications.

B. Lessons from different practical approaches to agri-environmental measures
First part of the workshop should compare and contrast the value/success of REPS schemes on different types of farms and their effectiveness in obtaining environmental goals for the area as a whole

This could address the appropriateness of the 'broad and shallow' and the 'deep and narrow' approaches in relation to ecological theories and concepts of metapopulations. This would include discussion of how to monitor ecological benefits.

Remainder of the workshop to compare the findings from the Irish farms with other European approaches in terms of (a) any other approaches or changes to current that could be of use in Ireland, (b) lessons to be learned from other areas of Europe and (c) applicability to other types of farm and farmer.

Conclusions and policy implications.

C. Integrated rural development: can the ideology be translated into practical measures?
First part of workshop to compare and contrast the opportunities and constraints provided by the Rural Development measures and consider what the effects would be on farm viability and ecological interest if they are widely adopted.

Remainder of the workshop to consider, in a context, the findings from the Irish farms, and compare and contrast different approaches being proposed in National Rural Development Plans, e.g. the new area payments in LFAs, support for certain groups of farms, encouragement for diversification, etc.

Conclusions and policy implications.

D. Approaches to livestock typologies for environmental purposes

First part of workshop to describe the main systems seen and their key characteristics. The dairy typology could form the basis for discussion of how to extend this approach to other sectors, and how to make it spatially explicit. Also, how to collect sample information from farms to predict farmers' responses to new policy incentives.

Conclusions and policy implications.

Introduction to Ireland

Topography of Ireland

The island of Ireland, on the western fringe of Europe, has a land area of 82,400 square kilometres. The topography of the island resembles a saucer, with the central low-lying portion surrounded by a rim of higher mountains. The central lowlands, underlain by carboniferous limestone, form the largest continuous stretch of carboniferous limestone in Europe (over 20,000 km^2). Three-quarters of the island lie below 150m. This central lowland is covered by drift deposited after the last ice age that ended about 12,000 B.P., consequently it is productive soil. This factor, combined with the plentiful rainfall, accounts for the thick carpet of grass for which the island is renowned. The rim of the island consists of largely of higher ground, yet only five percent of the land is over 300m. This higher ground was formed in different geological periods, and has been influenced in varying degrees by weathering and glacial activity. This has resulted in a landscape that varies considerably, and often quite dramatically, from region to region. The Burren, a 450km^2 karst area in the mid-west of Ireland, is unique as it is one of the few places in Ireland where the rock skeleton is not clothed by a skin of soil (Aalen et al. 1997).

Importance of agricultural sector

Agriculture, forestry and tourism are the major economic activities in rural Ireland, and approximately two fifths of Ireland's population lives and works in rural areas (Hickie et al 1998). Agriculture plays a fundamental role in the national economy, with gross output and gross product at market prices of agriculture in 1997 being c. £3,309m and £1693m respectively. Ten percent of the country's workforce is directly employed in agriculture, forestry and fisheries, but this percentage has declined from almost 27% in 1970. Despite this downward trend, in 1995 Ireland was still more than twice as dependent on agriculture in terms of employment and almost three times as dependent in terms of Gross Domestic Product than was the EU as a whole (Hickie et al 1998).

Some agricultural statistics

- In 1995, there were c. 153,400 farm holdings in the Republic, an overall decline of 33% in the number of farm holdings since 1975.
- Between 1975 and 1995, average farm size increased from 22.3ha to 28.2ha, an increase of 26%.
- Almost 88% of Ireland's agricultural area was owner-farmed in 1995.
- In 1995, 96% of all farms were engaged in livestock production: 90% of all farms had bovines; 31% Sheep; 28% dairy enterprises; 1.6% pigs and only 1.3% had broilers.
- 92% of all farm holdings have permanent grassland. 54% of all farms have some arable land (including forage crops) but only a very small number devote more than one hectare to crops such as cereals, sugar beet and potatoes. More than half of the arable area is used for forage crops.
- In 1993, almost 75% of all holdings were located in Less Favoured Areas (LFAs), with 52% of the country classified as severely handicapped, 19% less severely handicapped and 1% being coastal areas with specific handicaps. In 1995, 70% of all holdings were in receipt of headage allowances, receiving on average 1575 ECU per holding.
- There has been a significant intensification of agricultural practices since 1970s. For example, the use of fertiliser nitrogen (N) has increased more than 300% between 1973 and 1995. Between 1980 and 1995 cattle compound feed production increased by 85%, pig feed production by 26% while poultry feed production increased by 61%. The production of silage has increased from 0.3 million tonnes in 1960 to over 200 million tonnes in 1990. The average stocking density per hectare has increased by approximately 50% from 1973 to 1995. There are, however, marked regional variations.

Important rural development issues

At present, agriculture and rural communities are facing some important development issues, in particular:

- A decline in the number of individual farm holdings
- Low farm incomes, underemployment on farms and increase in part-time farming
- An ageing rural population and an age profile of farm holders that is regarded as an impediment of improving the efficiency of farm structures
- Land-use changes ranging from intensification of land-use practices to enterprise substitution and the discontinuance of farming activities with subsequent afforestation
- The suburbanisation of the rural landscape

The Rural Environment Protection Scheme

In 1994, the Rural Environment Protection Scheme was introduced as Ireland's response to Regulation 2078/92. The scheme has three primary objectives:

1. to establish farming practices and controlled production methods which reflect the increasing concern for conservation, landscape protection and wider environmental problems;

2. to protect wildlife habitats and endangered species of flora and fauna;

3. to produce quality food in an extensive and environmentally friendly manner.

The REPS is a voluntary, national scheme, open to landowners who farm in excess of 3ha. Prior to joining REPS, the landowner must get an approved REPS planner to produce a five-year farm development plan, in accordance with a series of measures which they agree to implement in order to achieve the objectives of REPS. The farm plan, which details a code of practice for the individual landowner is submitted for approval to the Department of Agriculture, Food and Rural Development. The REPS planners are either in the employment of *Teagasc* or are private planners (Deevy (1999).

The scheme comprises 11 compulsory measures, and five optional supplementary measures.

The compulsory measures are:

1. Nutrient Management Plan

2. Grassland Management Plan

3. Protect and maintain watercourses and wells

4. Retain wildlife habitats

5. Maintain farm and field boundaries

6. Cease using herbicides, pesticides and fertilisers in and around hedgerows, ponds and streams

7. Protect features of historical and archaeological interest

8. Maintain and improve visual appearance of farm and farmyard

9. Produce tillage crops without growth regulators

10. Become familiar with environmentally friendly framing practices

11. Keep such farm records and environmental records as may be prescribed by the Minister

And optional Supplementary Measures:

Supplementary Measure A – Conservation of the natural heritage

Supplementary Measure 3 - Rearing animals of local breeds in danger of extinction

Supplementary Measure 4 - Long-term set-aside

Supplementary Measure 5 - Public access and leisure activities

Supplementary Measure 6 – Organic farming.

The optional Supplementary Measure A provides an additional payment for following management prescriptions for sites designated as either Natural Heritage Areas (NHAs) or Special Areas of Conservation (SACs). NHAs are a series of sites proposed for designation because their nature conservation value is considered to be of national importance. To date, they have no statutory basis, but this should be rectified in the near future with the enactment of the Wildlife Amendment Bill. SACs are designated under the EU Habitats Directive (92/43/EEC), because their nature conservation value is considered to be of European importance. Supplementary Measure A is an option for the landowners in the Burren, because much of the Burren is designated as both SAC and NHA.

Under REPS, participating farmers obtain 151 Euro per ha (up to 40ha), and those opting also for Supplementary Measure A obtain an additional 242 Euro per ha (up to 40ha). For farm holdings in excess of 40ha, a payment of either 24 or 18 Euro per ha is received for each additional ha if the land is designated either SAC or NHA.

Who's who in Ireland

The Heritage Council was set up under the Heritage Act, 1995 as an independent state-sponsored body with the specific purpose of advising the Minister for Arts, Heritage, Gaeltacht and the Islands on heritage matters. The Heritage Council has a wide area of responsibility in heritage matters, covering both natural and built heritage. The principal aim of the Heritage Council is to propose policies and priorities for the identification, protection, preservation and enhancement of the national heritage.

***Dúchas* – the Heritage Services**, part of the Department of Arts, Heritage, Gaeltacht and the Islands, is the statutory body whose role is to protect,

maintain, conserve, manage and present the natural heritage. *Dúchas* is composed of five areas of operation: National Parks and Wildlife, National Monuments and Historic Properties, Waterways Service, Education and Visitor Service and National Inventory of Architectural Heritage. *Dúchas* manages directly approximately 80,000ha of land that is state-owned and designated as either a National Park or a National Nature Reserve. *Dúchas* also has responsibility for the identification and designation of sites as Special Areas of Conservation and Special Protection Areas under the EU's Habitats and Birds Directive respectively.

***Teagasc* – the Agriculture and Food Development Authority**, part of the Department of Agriculture, Food and Rural Development, is the national body providing advisory, research, education and training services to the agricultural and food industry. *Teagasc* is the biggest planning agency involved in the Rural Environment Protection Scheme (REPS). *Teagasc* operates a number of research centres around the country including a Horticultural Research Centre and a Rural Environment Research Centre. *Teagasc*'s research goals include the development of livestock and crop production systems designed to reduce production costs and raise product quality, and to do so in a manner compatible with environmental and animal welfare requirements.

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Introduction to the Burren

by Micheline Sheehy Skeffington & Mike Gormally

Micheline Sheehy Skeffington, Department of Biology, National University of Ireland, Galway, Ireland, and Mike Gormally, C/o Department of Micro-biology, National University of Ireland, Galway, Ireland.

Stories abound of people driving through the Burren and asking where all the flowers are –or even 'where is the Burren? –What is it?' It has long captured the imagination of visitors and is world-renowned for its flora, its glacio-karstic features and its archaeology. The Irish *An Bhoireann* means 'a stony place' and, though correct, hardly describes the wide open landscape of seemingly bare Carboniferous limestone hills that stretches over some 450 km^2. In an eerily practical officer's words from Cromwell's occupation (1650s), there was 'not water enough to drown a man, wood enough to hang one, nor earth enough to bury him'. He notes the soil to be 'so scarce that the inhabitants steal it from one another and yet their cattle are very fat. The grass grows in tufts of earth..… between the limestone rocks and is very sweet and nourishing' (Ó Cillín 1977 in Gosling 1991). To our knowledge the practice of stealing soil does not occur in the Burren, but cattle overwintered on the Burren uplands are renowned for their strength and ability to rapidly fatten once put on better land in the spring.

Vegetation history

However, 5-8,000 years ago the Burren was not bare, rocky and sparsely vegetated, but was covered in woodland, as pollen records demonstrate. As with the rest of Ireland, the region was re-colonised to its climax vegetation of deciduous forest following the retreat of the last ice about 15,000 years ago. In limestone areas such as the Burren, the dominant tree species were pine *Pinus sylvestris*, elm *Ulmus glabra*, ash *Fraxinus excelsior* and (especially in western regions such as this) yew *Taxus baccata*, along with some oak *Quercus* on deeper soils (Watts 1983). Hazel *Corylus avellana* was an early coloniser that persisted as an under-storey and still occurs widely today as scrub. Species such as spring gentian *Gentiana verna*, mountain avens *Dryas octopetala* and shrubby cinquefoil *Potentilla fruticosa* are not only widespread, but the last two occur in quantities that are not surpassed in Britain or NW Europe (Webb and Scannell 1983). They are, of course, relics of early post-glacial times, when these species were widespread throughout the tundra landscape of Ireland (Watts 1983). Then, with the advent of forest cover, as light-requiring species, they were excluded from all but high mountain areas of the Irish countryside and some parts of the Burren. Here, presumably in the upland Burren regions, the proximity of the rock to the surface must have resulted in a more sparse vegetation cover and localised pockets of open grassland existed throughout post-glacial times (Watts 1983). These acted as small-scale refuges for the arctic-alpines that then expanded with the opening up of the vegetation by early farmers.

Around 6,000 years ago, throughout the country, there were the first of repeated assaults on the forest by early settlers (Mitchell & Ryan 1998). In the Burren, the fossil pollen record of this time shows a greater proportion not only of hazel (implying a more open tree cover), but also of herbs and grasses, than during similar tree declines elsewhere. In fact, as the archaeological record suggests, it is probable that the Burren was one of the more densely populated regions of Ireland through Neolithic and early Christian times (Watts 1983).

The earliest pastoralists

Neolithic people were the first to practise pastoral farming in Ireland. The comparatively dry and fertile soils of the Burren were undoubtedly popular with early settlers and archaeological remains provide almost continuous evidence of human occupation since about 3800 B.C. (5,800 years ago) when the portal dolmens such as Poulnabrone were erected (Waddell 1991). The other dolmen-type tomb is the much commoner wedge tomb, thought to span a millennium or more from c. 3000-2000 B.C. (5,000-4,000 years ago) and the Burren has the highest concentration of these within Ireland (Waddell 1991). They are mostly confined to upland Burren regions and it is thought that the builders of these tombs were pastoralists, herding mostly cattle, but also sheep and goats. Though the proportion of these animals has changed a few times over the millennia, this is close to the form of pastoralism practised today in the Burren.

It is quite striking today to see cattle wandering freely over apparently treacherous fissured limestone areas of thin soils and sparse grass. Yet this practice of grazing cattle on the Burren hills clearly is the continuation of a tradition started in Neolithic times. At that time, though, it is likely that the peoples also lived in the uplands. Rather striking hut circles, so far undated, can still be discerned on top of Turlough Hill, over 250m

in height (Waddell 1991). Nowadays, it is mostly in winter that the cattle are put up on the hills, where, due to the heat-holding properties of the rock and the hardy nature of species such as blue moor grass *Sesleria albicans*, the sward never entirely ceases to grow. The lime-rich soils provide high calcium and other minerals for the animals that enable them to fatten remarkably fast when returned to the lowlands.

This practice of winterage is not documented for many centuries, but probably dates as far back at least as mediaeval times (Plunkett-Dillon 1985 in Bohnsack & Carrucan 1999). The ring forts, striking earth- or stone- built circular enclosures and typical of the Irish landscape, are frequent in the Burren, notably again in the uplands. Most have not been excavated and therefore cannot be dated, but it is thought that the majority date from between A.D. 400-1200 (Gosling 1991). Though the basic structure is circular, many have a series of enclosures and walls that suggest use as paddocks and pens for animals. One particularly large ring fort is at Caher Chomáin, in upland Burren, south of Carron and is the only Burren ring fort to date to have been excavated. Apart from the remains of six houses, some utensils and ornaments, over 4,000kg of animal bones were found. Of these bones 97% were of cattle; sheep and goat made up 1% between them and the rest were of horse and deer. This gives an estimate of meat eaten by the people, but not necessarily the true proportion of livestock kept. Thus, at this fort, very numerous spindle-whorls were found, indicating that wool, and consequently sheep, were an important element of farming at that time (Gosling 1991). It is thought that most ring forts were the centres for more than 100ha farms (Gosling 1991) and around A.D. 300, a big increase in woodland clearance occurred, bringing about an expansion of grasslands that never fully receded after that era. Contemporary accounts only start around the 8th century and they refer to the predominance of cattle in the Burren. It is likely that were important already some centuries earlier. The practice of reverse transhumance - bringing cattle up onto the hills from October to the following spring is not documented until the 17th century (Nelson 1997), but again was undoubtedly practised for many centuries earlier.

Sheep

In the early 19th century, the predominant farming activity was sheep herding and to a lesser extent cattle herding (Bohnsack & Carrucan, 1999). The Burren is documented as providing "short sweet herbage for sheep.... of which immense numbers are annually reared, and usually sold at the fair.... and from thince drove into Leinster to be fattened at three years old" (Dutton, 1808 in D'Arcy, 1992). There is a tremendous wealth of folklore associated with shepherding that existed in the Burren in the late nineteenth and early twentieth century. The species most popular included the Galway ewe, Galway Cheviot cross, Border Leicester and Oxford Downs. Anecdotal information suggests that the breed most suitable for the uplands was the Galway Cheviot which "love to travel and ascend the high hills like their grandmothers in Connemara" (Breatnach, 1991). Herders were common on the uplands and they worked for landowners who owned thousands of acres of the Burren. One herder states that, in addition to a few acres with the house, he had permission to keep "two milk cows and a horse.... and twelve sheep... on the land" " (Breatnach 1991).

June data (1930-91) for eight selected DEDs in North Clare (Bohnsack and Carrucan, 1999) show that, except in the 1980s, the numbers of sheep have not decreased appreciably. In 1930-40, sheep numbers exceeded that of cattle, but the numbers of the latter steadily increased such that in the 1990s they far exceeded that of sheep. This shows a trend towards more specialised and less mixed types of farms since the 1950s. But even in the 1930s-40s, in terms of livestock units (LUs), cattle were just over 7 times greater than sheep, whereas by 1991, aggregate LUs for cattle had almost doubled and were now more than thirteen times greater than sheep. It is likely therefore that cattle (predominantly shorthorns) have been the most important grazing animal on the Burren for most of the 20th century. These data represent summer figures only and for whole DEDs and thus do not entirely reflect changes in stocking levels on the winterages that comprise the upland or rocky parts of farmland (Bohnsack & Carrucan 1999). Domestic goats played an important, if small role in farming in the past. Trends in LUs show that goats were just under 4% of cattle LUs in the 1930s but had decreased to just over 0.5% by 1980 (Bohnsack & Carrucan 1999).

Present-day farming

Farming practices today are very different to those in the past. Although farm sizes have increased, there are fewer full-time farmers, and headage payments, livestock premia and area aid make up the bulk of agricultural income in the region (Bohnsack & Carrucan 1999). Market trends have encouraged farmers to keep heavier continental breeds that require supplementary feeding and these have replaced the shorthorns on the winterages. In terms of overall livestock units, sheep (and goats) have played a lesser role especially since the mid-nineteenth century. Breeds of sheep have also changed and nowadays they are rarely kept in the uplands on the winterage. Lowland breeds such as Suffolk have replaced the hardy Galway Cheviot and they are bred for lamb meat rather than wool and mutton. Although domestic goats have declined in number, it is estimated that there are

1000 feral goats currently in the Burren region (McGuire 1998 in Bohnsack & Carrucan 1999). While it is likely that domestic goats in the past prevented scrub encroachment of grassland areas, feral goats today are often regarded by farmers as a nuisance since they knock walls and graze improved grasslands.

Agri-environmental schemes

The Burren flora that includes the arctic-alpine element referred to above, has remained abundant entirely as a result of millennia of low-intensity pastoral farming in the region. The more unusual flora is mostly confined to the winterage (upland or rocky areas), where the emphasis has been on winter grazing, a lack of fertiliser use and regular herding of animals. The Irish response to the EU Agri-environment Regulation 2078/92, the Rural Environment Protection Scheme (REPS) was introduced in 1995 and was the first such scheme to recognise the role of farming in nature conservation. It is the first method to recompense Burren farmers for managing the Burren landscape in a way that has preserved so many habitats and flora of environmental interest.

However, recent trends in farming, such as the shift to continental breeds, the use of supplementary feeding (necessary for larger animals throughout the winter) and, since the 1980s an acceleration of reclaiming rocky land, has brought about subtle changes in the traditional farm practice. The practice of herding has died out and, because farmers are increasingly part-time, the tasks of maintaining walls and scrub control are more difficult to keep up. It is therefore critical at this time to examine the REP Scheme as applied in the region and assess its efficacy not only as a nature conservation measure, but as a practical method for maintaining farm livelihoods. In 1998 this was undertaken for ten farms from throughout the Burren by Bohnsack & Carrucan (1999), as commissioned by the Heritage Council. As a result of this and a series of meetings between members of the Wildlife Committee of the Heritage Council and Burren representatives of the Irish Farmers' Association, a leaflet (*Getting it Right for the Burren*) was produced summarising common views regarding positive and negative aspects of the REPS in the Burren. Scrub control was perhaps the single most difficult factor to maintain within the REP Scheme. However, it was also stressed that the farmers are the people who have the greatest knowledge of the Burren landscape and its management and that they ought to be consulted to a much greater extent when drawing up such schemes. It is in this context that this Forum is meeting in the Burren and involving the farming community of the region at all levels of the conference.

Conclusions

Clearly, there is a need to develop a management strategy for the Burren region that balances the needs of the local communities with the necessity to protect habitats of international importance. Much research needs to be undertaken on the management requirements for the habitats of the Burren, particularly stocking densities that are likely to vary at different locations within the Burren. Experimental field trials are costly and take many years to complete. However, the recording of traditional farming systems is relatively easy and this knowledge (integrated with modern agricultural methods) could be used to manage Burren habitats today. It is hoped and believed that this forum (particularly the workshops) fostered real and continuing dialogue between local farmers, scientists and policy-makers, each of whom had specialised inputs to make.

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The Burren, its farming and wildlife

by Ute Bohnsack

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The Burren is a limestone karst region that occupies several hundred square kilometres of the northwestern part of County Clare along the midwestern seaboard of Ireland. The region is internationally renowned for its floristic, geomorphological and archaeological interest and diversity and it is probably the most impressive limestone karst site in north-western Europe. Geographically the region is not clearly defined but it is generally taken to comprise two units: The Burren uplands cover an area of 367 km^2 consisting of a rocky limestone plateau largely between 120 and 240m with intervening coastal and drift covered lowland areas. Bordering this area to the East are the even more extensive Burren lowlands with considerable expanses of fen, bog, alluvium and drift, calcareous-oligotrophic lake systems and large areas of limestone pavement.

The region is of outstanding conservation value with extensive areas of 'priority habitat types of community importance' such as limestone pavements, orchid-rich calcareous grassland and turloughs, as well as a number of 'priority species of community importance' as defined under the EU Habitats Directive. Approximately half of the area has been listed both as Natural Heritage Areas (NHAs) under national legislation and as Candidate Special Areas of Conservation (CSACs) under the EU Habitats Directive.

The Burren is a cultural landscape that has evolved out of the cultural interaction between man and the environment over a period of almost 6000 years. Traditional low-input and predominantly cattle-based pastoral agriculture over many centuries has helped to maintain one of the most important and extensive calcareous grassland areas as well as what is probably the most important oligotrophic, calcareous system of freshwater lakes in Europe.

An unusual variant of transhumance has been practised in the region possibly since the Middle Ages. This involves moving cattle to the uplands during the winter months. Winter grazing appears to have maintained the species-rich limestone grasslands (*Festuco-Brometea*) by controlling competitive grass species. Goats, once dispersed in domestic herds but now occurring in large feral herds, appear to play an important role in controlling scrub encroaching on grassland areas. The role of sheep grazing in maintaining the Burren's grassland communities is unclear.

Agricultural production structures in the region have undergone considerable change - particularly following Ireland's agricultural policy falling within the framework of the EU Common Agricultural Policy in 1973 - including a drastic decline in the number of farms, larger farm sizes, fewer full-time farmers, increased stocking densities and changes in the types of breeds being kept. There has been a considerable degree of intensification and specialisation of production. These changes have led to an imbalance in the agriculture-environment relationship in the region.

The main policy response since 1994 has been the promotion of the Rural Environment Protection Scheme (REPS), the voluntary Irish agri-environmental scheme under Reg. 2078/92, to ensure minimum environmental standards and to secure additional environmental benefits, with a special, compulsory management tier applying in NHAs/SACs. The scheme is administered by the Department of Agriculture and Food. The key adjustments made on REPS farms are mostly environmentally beneficial, but the farming prescriptions are unlikely to be sufficiently strict, specific and proactive to achieve the objectives of the SAC designations, including the restoration of sites and populations of species of Community interest to a favourable conservation status as defined in the Habitats Directive.

It is very difficult to determine the effectiveness of the REPS in maintaining or restoring the favourable conservation status of the Burren habitats because of (i) a lack of baseline information relating to the current conservation status of habitats and species, (ii) the absence of a clear and coherent conservation strategy for the region with set targets for the REPS to achieve, (iii) a lack of proactive local research into conservation management practices and (iv) a lack of monitoring and evaluation procedures. The latter also hinders an assessment of the agricultural and socio-economic impacts of the scheme. The first five-year cycle of the REPS has been completed and REPS II, with no major changes, currently awaits approval from the EU Commission.

Section 3

Items marked * are included as summaries or full texts in this section.

Monday 19th June

SESSION 3 Linking ecological science, farmland biodiversity and environmental practice

Chair: *John Hopkins, UK*

09.00 Biodiversity of extensively used pastures and meadows in Switzerland: reflections on their management and proposals for agricultural policy support.
Willi Schmid, Switzerland *

09.30 Farming practices and soil biodiversity in the Portuguese montados.
Teresa Pinto Correia & Ana Fonseca, Portugal *

10.00 Metapopulations and butterflies: the need for landscape scale conservation..
Martin Warren & Nigel Bourn, UK *

10.30 Coffee

11.00 Biodiversity beyond the boundaries: Do small invertebrates have a future in extensive pastoral ecosystems?
Jervis Good, Ireland *

11.30 Dispersal of plants and animals in livestock systems with special reference to sheep.
Benjamin T. Hill & Burkhard Beinlich, Germany *

[Poster: Condition of Bashkortostan Transural steppe pastures and the role of traditional agroecosystem in steppe biodiversity conservation
Ural Unusbayev *]

[Poster: The shepherd's road: pastoralism and tourism in Piemonte (NW Italy).
R. Fortina, L.M. Battaglini, S. Tassone, A. Mimosi & A. Ripamonti *]

[Poster: Local breeds conservation and typical products in Piemonte (NW Italy).
L.M. Battaglini, R. Fortina, S. Tassone, A. Mimosi, M. Bianchi *]

12.00 General Discussion

12.30 Lunch

Biodiversity of extensively used pastures and meadows in Switzerland: reflections on their management and proposals for agricultural policy support

by Willy Schmid

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Observations
This paper presents evaluations of data measuring the impact of grass management on flora and fauna. Observations were carried out from 1996 to 1998 on land belonging to farm enterprises of average size, therefore not to vast grazing systems such as the Alps. In different climates of Switzerland the diversity of species such as plants, butterflies, grasshoppers, wild bees, wasps and spiders occurring in cattle and sheep pastures were recorded and compared to data obtained from swards with grass to be cut. Furthermore the effects of different grazing systems on the diversity of species were evaluated and the conservation value of the land estimated.

Flora results
The results clearly demonstrated that the variety differed between conservation and grazing areas, cattle grazing pastures containing a wider range of plant species. On the other hand in sheep pastures the variety of species present was smaller than in cut grass swards. Protected species such as orchids occur seldom in all types of grazing grounds. Grazing pastures had always below 50%, and on average approximately 40%, of plant species in common with conservation areas. The vegetative cover of grazing land contained more grass species, annual plants and weeds compared to conservation areas.

Fauna results
For all observed and recorded animals, cattle grazing pastures showed generally more variety in species compared to cut grass swards. There was a significant difference at the 5% level between the two grass management systems for butterflies (+ 4.4 spp.), wild wasps, aculeate bees (+2.1 spp.), ground spiders (+6.5 spp.) and web-building spiders of the vegetation layer (+2.0 spp.) whereas the differences were not significant for grasshoppers (+1.2 spp.) and non-web-building spiders of the vegetation layer. Attention should be drawn to cattle grazing pastures, in which compared to other grounds significantly more species (24.7) could be found; the same tendency could be observed for protected species but the differences were smaller. The biggest variation was found for butterflies (+2.0 spp.), the smallest for grasshoppers (+0.5 spp.). No significant difference could be found between cattle and sheep grazing pastures.

Discussion and conclusion
Overall it can be stated that grazing pastures under extensive grass management contain a wider range of species than extensively managed conservation areas. Considering fauna as the main component of interest, the value of an extensively managed grazing pasture equals or is above the value of an area with grass to be cut. Grazing management and location factors decide the width of the range possible. In many cases only 20-50% of the species present could be found in both grass management systems.

Reflections on their management
- More species can be found on unfertilised grassland ecosystems with low nutrient supplying soils than on nutrient-rich, fertilized soils.
- The probability of finding characteristic grazing-pasture traits such as stones, overgrown vegetation, shrubs, small woodlands, patches of degradation and erosion as well as cattle paths rises as the level of extensification increases; pasture should contain 5-15% of these.
- A part sub-utilisation of the pasture with surplus herbage is desired and should ideally account for 10-20% of the area. In order to succeed in establishing and developing biodiversity, pastures should be of at least 1 hectare (2.5 acres).
- Locations for extensive grazing should preferably be of topographical variety and sloped, so that diversification within the pasture develops, enhanced by cattle paths.
- Warm and dry locations are more suitable for extensive grazing pastures and more species can be found in them than in moist, shadowy places. The most diverse accumulation of species can be found when locations of various humidity occur in close proximity.
- A combination of grazing and conservation management is undesirable for diversification purposes (as well as thorough pasture maintenance) due to the fact that the characteristic grazing-pasture mentioned above cannot develop.

- Breed type does not have a significant effect on pasture traits. Nevertheless high-yielding breeds are quite unsuitable for extensive grazing due to weight, intake and yield. It needs to be mentioned that in Switzerland a wide yield range exists within breeds; therefore some animals are always suitable for extensive feeding management systems.

Proposals for agricultural policy support
Political encouragement and support is essential that pastures are managed extensively. In Switzerland forage cultivation is indirectly supported by quite high direct payments for ruminants. The Swiss agricultural policy recognises extensively managed grazing pastures as one type of ecological compensation area, of which farmers require 7% to be entitled to direct payments. Some counties support these pastures directly with subsidies from the county council. At present there exists one definition for an extensive grazing pasture and how it needs to be managed.

Reports
Three detailed reports to the case studies 1996, 1997and 1998 exist. Reports about the study can also be found in *Ornis* and *Schweizer Bauer*, two Swiss journals. All these are written in German and can be ordered via the author.

Farming Practices and Soil Biodiversity in the Portuguese Montado

by Teresa Pinto-Correia and Ana Fonseca

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The Montado is an agro-silvo pastoral system corresponding to an open oak formation of cork and holm oaks in varying densities, combined with a rotation of cultures/pastures/fallow at the soil level. This land use system is dominant in the region of Alentejo, Portugal, but despite its sustainability, it has been under different processes of change in the last decades, often leading to a degradation of the system and a simplification of the landscape. This paper presents part of the results of an interdisciplinary research project concerning specifically the cork oak Montado, the one with more clear economic viability due to the market value of cork.

From the knowledge that soil biodiversity is a fundamental factor for the functioning of the whole system, and that different management practices are actually being applied to the Montado system by land-owners in search of an adequate balance, this project tries to combine the understanding of the farmers' strategies and resulting management practices with their impacts in the cork oak mycorrhizas and sporocarp diversity. The collection and organisation of information concerning the management practices actually used as well as those used in the last decades, and their relation with the various determining factors is also one of the objectives of the project. Furthermore, this study aims also at identifying whether soil condition is determinant, and in what form, for the strategies defined by each land-owner for his different parcels.

Metapopulations and Butterflies: The Need for Landscape Scale Conservation

by Martin Warren and Nigel Bourn

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The intensification of agriculture and forestry during the twentieth century has led to a massive loss of semi-natural habitats, leaving remaining patches small and fragmented. European butterflies have been particularly badly affected: 71 of the 576 species are threatened and many more are declining. A large amount of research has been conducted recently on the impact of habitat fragmentation on butterflies and the results have important implications for the conservation of wildlife in modern, fragmented landscapes. This paper aims to review the main results and to explain the urgent need for landscape scale conservation.

While some butterfly species are highly mobile, many are 'habitat specialists' which form populations in discrete patches of habitat. Despite their colonial behaviour, adults occasionally move between nearby habitat patches, giving rise to linked populations known as metapopulations. These function over a far wider area and are probably typical of over half the butterflies in Europe, and probably many other wildlife species. Research has shown that the rate of extinction tends to be higher on smaller or isolated sites, and that sites are more likely to contain populations if they are larger or close to others. The factors causing the precise pattern of occupancy include the mobility of each species, the size and suitability of each patch, and the degree of isolation. Small habitat patches tend to have higher emigration rates of adults and, if they are close to other occupied sites, can contain a higher proportion of immigrants. They thus have a high turnover of individuals that larger patches and are more prone to extinction.

The crucial implication is that the fate of each local population or colony depends not only on conditions within that breeding patch, but also the fate of neighbouring patches. Mathematical models are now being used to predict extinction rates using data from field studies. Where habitat patches are very small (e.g. 0.5-10 ha is typical for many threatened British butterflies), 15-20 patches may be needed to ensure a reasonable chance of long-term survival. However, the exact number will vary from species to species and has yet to be tested in practice.

Habitat quality and changing management are also crucial factors causing local extinction rates and may be more important than site size or isolation for many species. Another, perhaps even more pressing, impact of fragmentation is thus the difficulty of perpetuating traditional systems of grazing or hay-making that have maintained crucial butterfly habitats for hundreds of years. Abandonment and changing management are now among the most serious threats to butterflies across Europe.

The survival of species in fragmented habitats requires policies that operate at the landscape level and cover whole networks of sites. The paper will explore possible mechanism and the potential of agri-environment schemes in tackling these fundamental issues. Although they seem a promising mechanism, few studies have been done, and problems still remain about how they might cater for the needs of individual threatened species.

Biodiversity beyond the boundaries: do small invertebrates have a future in extensive pastoral ecosystems?

by Jervis A. Good

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Traditionally, invertebrate conservation specialists operate within certain assumptions, which create the boundaries that define their subject. This paper attempts to transcend some of these boundaries, with the aim of predicting how data on small invertebrates (defined as those without a vernacular name) can be most efficiently used in the future maintenance of biodiversity in extensive pastoral ecosystems. A case study is presented of the ecological changes in a mixed farm and the associated changes in management practices. The recorded and predicted changes in characteristic staphylinid beetle assemblages on this farm are examined in terms of the potential to manipulate the decision making process to enhance invertebrate biodiversity. The importance of the sociocultural and socioeconomic factors which caused these changes emerges from this case study. The characteristic staphylinid fauna of selected extensive Irish pastoral systems in analysed for the impact of the socioeconomic and sociocultural changes recorded for the case study farm. It is concluded that the diversity of small invertebrates characteristic of pastoral ecosystems will be maintained only by default under management systems designed for coarse-scale agri-environmental objectives, or by farm 'ecofeature' credits for individual farmers. The type of data required on invertebrates in these two cases is discussed.

Dispersal of plants and animals in livestock systems with special reference to sheep

by Benjamin T. Hill and Burkhard Beinlich

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Low-intensity agricultural lands are often characterised by a high level of biodiversity and therefore present a potentially high value for nature conservation. The intensification of land use on the one hand and the decline of traditional farming practices on the other have lead to a high degree of habitat fragmentation for these biotopes.

In fragmented landscapes basic ecological processes like dispersal or metapopulation dynamics may be severely impeded. This can lead to reduced individual fitness and increases the chance of stochastic extinction of local populations. This holds true especially for plants and animal species with a low individual mobility (e.g. snails, grasshoppers). For these taxa passive dispersal by means of grazing livestock may serve as an important vector to counteract the above mentioned effects.

In several studies the large amount of plant seeds able to germinate in different livestock faeces was demonstrated. For cattle the estimates range from 3000-18000 diaspores being transported and deposited per day. Taking different feeding habits and digestive systems into account, the species composition and abundance vary between animal types.

The epizoochoric transport may be of even more importance. In the course of one summer 8500 seeds of 85 vascular plant species were recorded in the wool of one sheep, 48 plant species occurred between the claws. Marked diaspores remained on the sheep for more than 4 weeks. In land use systems with transhumance this could mean a translocation of 100 km and more.

Additionally, 13 grasshopper and 4 snail species were found on the sheep. The observed maximum distance for a riding grasshopper was 700 m. Plastic "snail dummies" were transported over a distance of 800 m. These distances exceed the normal home-range of these taxa by far.

Looking at the dimension of transhumance and shepherding of different livestock species in Europe in a historical perspective, the importance for dispersal processes is evident.

Condition of Bashkortostan Transural steppe pastures and the role of traditional agroecosystem in steppe biodiversity conservation

by Ural Unusbayev

Most of Bashkortostan steppes have been ploughed in 1950-1960. Steppes survived basically on the Irendik Mountains and close around them, where ploughing is impossible. The surviving steppe areas are using for intensive grazing. Cattle load exceeds rangeland capacity on average by 3 times, in some farms more than 10 times. As a result pasture damage greatly increases. However on the Irendik Mountains wilderness steppe areas have been saved, due to farmers' traditional rearing of semi-wild horses of local breed. The Bashkort horse has retained some characters of the wild ancestor (Tarpan). This allows the keeping of horses in natural conditions without human participation. Herds of semi-wild horses behave in the steppe like wild Tarpans. The traditional agroecosystem does not transform natural ecosystem; it is integrated into the steppe landscape as a natural component. Pastures of traditional farms play an important role in steppe biodiversity conservation.

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Introduction

The Transural steppe of Bashkortostan is located on the east of the Ural Mountains (Fig.1). The steppe is divided by the Irendik Mountains at the average height above sea level of 400-500 m. Annual precipitation varies from 265 to 400 mm. The vegetation growing period is 134 days (Khaziev et al. 1997). The unique Transural steppe landscapes were almost completely destroyed during a period of 'mastering wilderness steppe' in 1950-1960. Vast non-ploughed steppe areas survive only on the Irendik Mountains and close around them. Wilderness grassland areas (441600 hectares) include: stony steppes (30%) with prevalence in the plant communities of *Onosma simplicissima, Stipa lessingiana, Festuca pseudovina, F.valesiaca, Koeleria sclerophylla, Artemisia austriaca* and *Carex supina*, and typical steppes (70%) with dominant species *Stipa pennata, S.pulcherrima, Festuca pseudovina, Koeleria sclerophylla* and *Artemisia austriaca*.

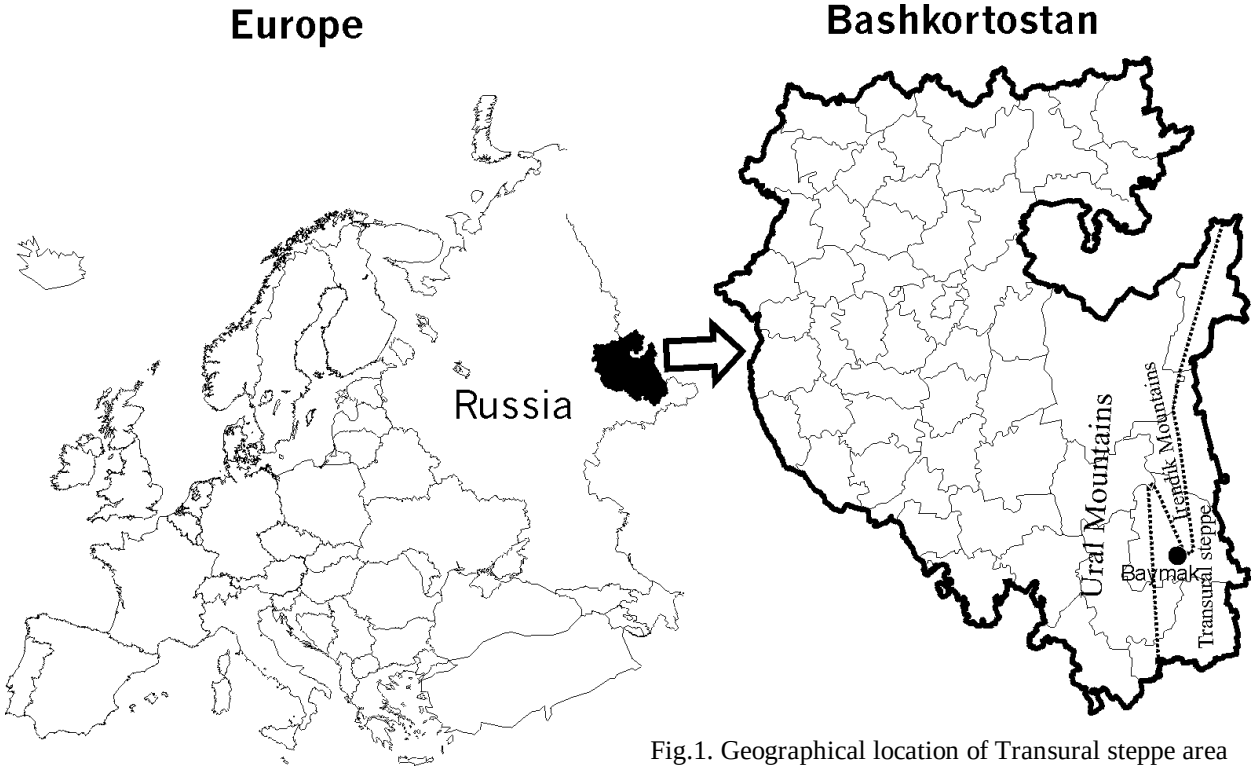

Fig.1. Geographical location of Transural steppe area

Table 1. Condition of Transural steppe pastures

Pasture modification	Portion (%)	Plant species richness per 100 m^2	Cover (%)	Above ground phytomass (kg/ha)	Dominant plant species
Completely destroyed	5	15-40	5-25	500-2000	*Chenopodium album, Polygonum aviculare, Lepidium ruderale,*
Hard grazed	25	50-60	50-65	500-2000	*Festuca pseudovina, Artemisia austriaca, Koeleria sclerophylla*
Moderately grazed	60	65-80	65-90	3000-8000	*Festuca pseudovina, Stipa capillata, Artemisia austriaca*
Light grazed	10	80-95	95-100	5000-12000	*Stipa pennata S.pulcherrima S.lessingiana*

Condition of Transural steppe pastures

The surviving steppe areas are used for intensive grazing. The cattle load exceeds rangeland capacity on average by 3 times (Fig.2), in some farms more than 10 times (Mirkin *et al*., 1998). As a result pasture digression ever-increases widely.

Our research in Baimak Province in 1998-1999 showed that 5% of steppe pastures had been completely destroyed by overgrazing (Table 1), 25% hard grazed, 60% moderately grazed, and 10% light grazed.

Traditional horse breeding

In the south of the Irendik Mountains primordial steppe areas have survived. This is a merit of farmers who maintained the local tradition of extensive pastoralism with free-range management. Agricultural production of these farms is based on traditional rearing of semi-wild horses of local breed. The Bashkort horse has retained some characteristics of the wild ancestor (Tarpan). This allows the keeping of horses in natural conditions without the human participation throughout the year. Herds of semi-wild horses behave in the steppe like wild Tarpans (Sabaneev 1873).

Semi-wild horses are ideally adapted for existence in the steppes. Reasons for the comparatively "light" influence of horses on steppe vegetation follow:
- a long radius of pasturage (7-8 km) and active moving. This allows the even distribution of the grazing load over the vast area;
- a broad spectrum of eaten species of grasses that

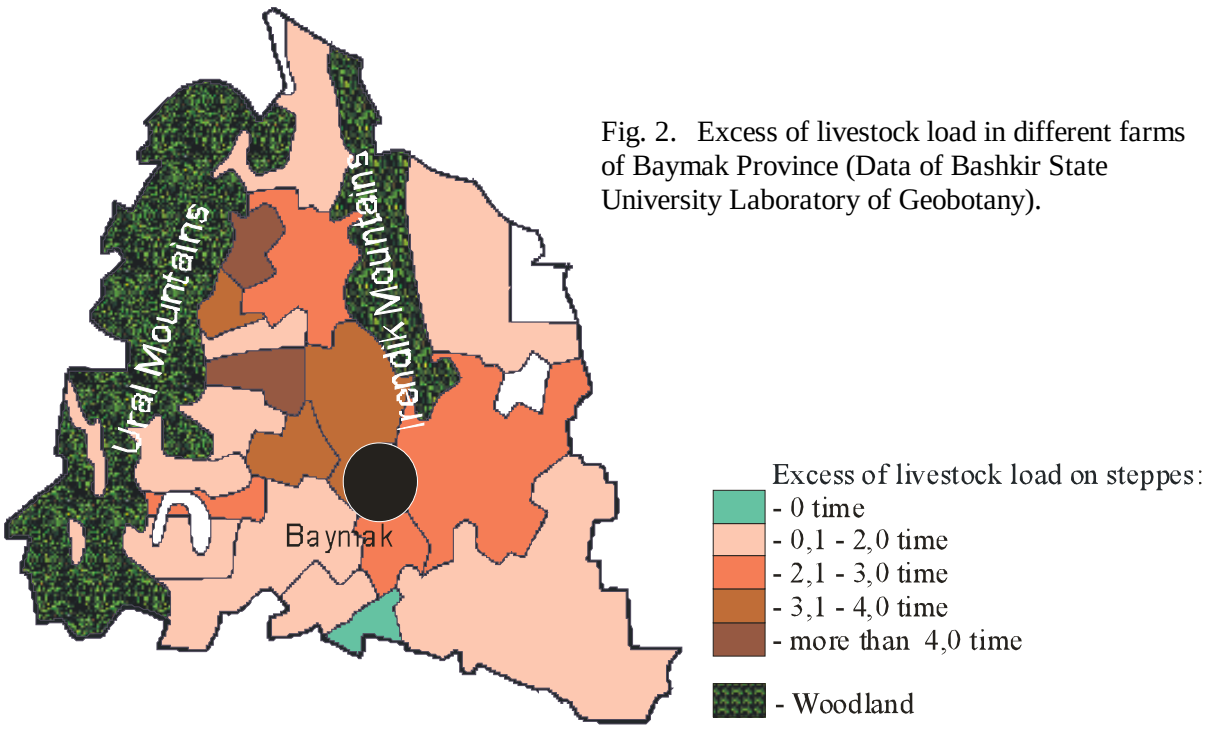

Fig. 2. Excess of livestock load in different farms of Baymak Province (Data of Bashkir State University Laboratory of Geobotany).

allows avoidance of harmful selective grazing;
- an absence of constant stopping places or round-ups on which other breeds of livestock completely destroy vegetation;
- complex social organization of herds (30-50 animals in each) with one stallion at the head. Different herds never approach one another closer than 0.5 km. Otherwise conflict between stallions is inevitable. Different herds are evenly distributed over the area because of this behaviour. This allows even distribution of grazing load over a wide landscape. Under such organisation, the load of horses on the pasture does not exceed 1 head per 3 ha. This corresponds to the density of wild ungulates existing in the Eurasia steppes before their conversion by humans (Mordkovich *et al.* 1997).

Experience of traditional free-range management in the Transural steppe opens the possibility of farming without prejudice to the natural ecosystem. Pasturing of semi-wild horses plays an important role in steppe biodiversity conservation.

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The shepherd's road: pastoralism and tourism in Piemonte (NW Italy)

By R. Fortina, L.M. Battaglini, S. Tassone, A. Mimosi & A. Ripamonti

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Introduction

The Verbania alpine valleys and the Novara plain (Piemonte, NW Italy) are periodically crossed by transhumant flocks of Biellese sheep breed (see picture at end of paper). At the end of September flocks move from the Alps to the plain for wintering. At the beginning of March they cross the Novara plain, and reach in July the alpine pastures of the Ossola valleys (province of Verbania), where they stay for the whole summer.

Shepherds follow some traditional routes, the so-called "shepherds' roads", but most of them – especially in the Novara plain – are interrupted by new roads, buildings and other facilities. Transhumance is thus becoming increasingly difficult due to the loss of ecological continuity and forage resources. Its decline is raising concern for the maintenance of surviving agro-ecosystems of the Novare plain, a typical "cultural landscape" made up of ricefields, irrigated meadows, moorland, and riparian and floodplain woods.

The aim of the study, partly financed by WWF and Novara province, was to locate and describe the routes actually followed by shepherds, and to point out the main characteristics of a representative area for tourism purposes. Future developments of the WWF project will include actions for the conservation of the natural resources and environment of the "shepherds' roads".

The shepherds' roads

The main routes followed by Biellese transhumant flocks are represented in Map 1. Routes may change from year to year because transit permissions for flocks are compulsory but are often denied due to uneasiness on the part of the resident population. Another obstacle to the maintenance of transhumance is the presence of many infrastructures, especially from Bellinzago, Momo and Fara to Caresana, Robbio, Mortara and Garlasco (Novara plain). In these area flocks are effectively forced to graze on marginal areas, less productive but still important for their ecological value as part of the so called "residual ecological network" of the Po river plain. Among these semi-natural environments are the irrigated meadows and moorlands, whose maintenance still depends on the periodical presence of grazing animals.

The stock-numbers, origin, wintering and summering areas of flocks are shown in Table 1. The number of Biellese flocks has decreased dramatically during the last twenty years (CNR 1983; Fortina & Battaglini 1998). Nowadays only eight flocks of more than 500 sheep practice transhumance in Novara province. Two of them are owned by shepherds of Lombardia (Table 1: flocks 6 & 7).

Table 1 - Transhumant flocks of Biellese sheep breed in the Novara and Verbania province

Flock	Adult heads	Origin	Winter areas (Novara province)	Summer areas (Verbania province)
1	1500	Verbania	Surroundings of Novara	Surroundings of Verbania
2	600	Valle Anzasca	Surroundings of Borgomanero	Anzasca valley
3	600	Borgomanero	Surroundings of Ghemme	Bognanco valley
4	2000	Verbano	Novara and Pavia plain	Formazza valley
5	1400	Strona valley	Novara and Pavia plain	Strona valley
6	800	Lombardy	Novara plain	Lombardy (Bergamo Alps)
7	800	Lombardy	Novara plain	Strona valley
8	1300	Biella	Novara and Vercelli plain	Formazza valley

Map 1 – Main routes followed by shepherds
Spring-summer route (from plain to Alps)
Autumn-winter route (from Alps to plain)

The "Bellinzago" area

Among territories periodically crossed by transhumant flocks, the Bellinzago area (15 km north of Novara) has been chosen as representative of the Novara province plain. Here, one or two flocks of Biellese sheep, with more than 500 animals each, transit twice a year. Environmental, architectural and historical characteristics have been studied by the local WWF office.

Landscape is characterized by ricefields, corn and soybean fields, irrigated and permanent meadows, small woods (*Quercus* sp., *Betula* sp., *Populus* sp., *Carpinus* sp.) and moorland (Malcevschi *et al*. 2000). In a Special Area of Conservation (SAC), the "Baraggia di Bellinzago" biotope – partly managed by WWF – there are some rare and localized species, such as *Pelobates fuscus insubricus*, included in the Red Data Book of endangered species of EC (Andreone *et al*, 1992). Historical buildings and sites include Roman and Celtic graves, the mediaeval village of Badia di Dulzago and Cavagliano with an 18th century water mill. A tourist map of this area has been produced by WWF. Maps and road signs are expected to increase ecotourism and the sale of local products.

Conclusions

Shepherds follow some traditional routes, but many of them – especially in the Novara plain – are today interrupted by new roads, buildings and other facilities. Consequently, transhumance in becoming increasingly difficult due to the loss of ecological continuity and forage resources. The decline of transhumance in giving rise to concern for the maintenance of the surviving agro-ecosystems of the Novara plain, a typical "cultural landscape" of the Western Po plain.

Future developments of the project will include the study of other typical areas of Novara and Verbania provinces along the "shepherds' roads". The maintenance of ecological continuity and the conservation of moorland or permanent meadows should be included in safeguard measures for these territories. On these measures will depend the future of transhumance and its ecological function as a tool for the management of natural and semi-natural environments through grazing.

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Local breeds conservation and typical products in Piemonte (NW Italy)

by L.M. Battaglini, R. Fortina, S. Tassone, A. Mimosi, M. Bianchi

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Introduction

An original characteristic of livestock in the Piemonte region (NW Italy) is its diversity – which reflects the variety of landscapes, people and history. Even with the intensification and modernization of agriculture that has led to a standardization of the environment, the number of breeds and animal products in Piedmont is still high: 8 sheep breeds (Delle Langhe, Sambucana, Garessina, Frabosana, Saltasassi, Savoiarda, Biellese and Tacola), 3 cattle breeds (Piemontese, Oropa Red Pied and Tortonese-Varzese), 3 goat breeds (Sempione, Roccaverano and Vallesana), 5 protected designation of origin (PDO) cheeses (see labels on photographs) and many other typical products.

However, some of the autochthonous breeds are today seriously threatened and need preservation. Regional or provincial governments have undertaken conservation programmes, for example by means of breed associations. These programmes are generally based on improvement or conversion of traditional breeding systems through the development of rational grazing for increasing pasture production, and on economical aids for maintaining autochthonous breeds. Three examples of conservation programmes are described here.

• Stura valley • Alta Langa ■ Biella province

1 – "Sambucana" sheep

Only 2,300 animals of this meat sheep are bred in the Stura valley (Cuneo province). According to the FAO report (1993), the Sambucana does not appear in the list of breeds threatened by extinction, but it is included among the breeds that receive contributions provided under Regulation 2078/93/EC (implemented by the Regione Piemonte Government Administration).

Since 1985 a local association of shepherds (*Consorzio Escaroun*) has been selecting rams and ewes, and the number of animals is increasing. *Escaroun* activity includes conservation of the Sambucana breed, with the constitution of a *Rams Centre* for performance testing, promoting meat and wool marketing, breeder assisting services, buildings restructuring plans, and social and

cultural meetings (*Shepherd Feast*, *Alpine Shepherd History Museum*) (Bianchi *et al.* 1998).

The Sambucana sheep is a breed of intermediate size (60 to 70 cm height at a live-weight of 85 to 90 kg for the rams; 50 to 60 cm height at a live-weight of around 65 to 70 kg for females), with an intermediate trunk length and a wide and muscular rump. The rate of fertility is quite high (97%); the an adult supplies 3.5 kg of wool of discreet quality. The meat is produced by lambs butchered at 12 to 15 kg (light lambs), 20-25 kg (semi-heavy lambs) or from lambs named "tardun" (heavy lambs) of 40 to 45 kg, and from culled old sheep. The milk production varies from 100 to 120 kg per lactation.

The Sambucana sheep were traditionally grazed to alpine pastures without any protection during summertime. Due to the reappearance of wolves and feral dogs, sheep have recently been gathered in a few big flocks and protected by electric fences, dogs and alarm systems supplied by WWF Italy (a European Commission LIFE project).

The changes in breeding and grazing systems are under study. The aim of the present research will be to evaluate forage production and the composition of alpine pastures utilised by big flocks, as well as meat production (average daily gain) and meat quality (Cugno & Cavallero 2000). Social and economic problems related to predation by wolves or dogs are under investigation too, thanks to an Interreg project of Regione Piemonte and the "Marittime Alps Natural Park".

2 – "Delle Langhe" sheep

In Alta Langa (Cuneo province), livestock farming was a traditional activity producing typical cheese (i.e. the "Murazzano", from sheep milk). The marginalisation of Alta Langa is due to the industrial development of the Piemonte region, and also to the restricted opportunities for mechanisation in agriculture and the limited development of alternative activities, such as tourism and craft industries.

Livestock is represented mainly by the "Piemontese", an originally double-purpose cattle breed and by the "Delle Langhe" dairy sheep breed. The number of sheep has dramatically decreased. Today only 27 flocks (about 1200 animals) survive in Alta Langa, and the average number of sheep per flock is less than 20 (only 5 farms have more than 100 animals). Within these flocks several animals are crosses.

Delle Langhe sheep are raised for producing milk (120, 180 and 220 kg respectively in first, second, third and later lactations). The fat content is approximately 6.5% and the cheese productivity is around 20% from raw milk.

The current conservation programme for the Delle Langhe sheep includes: the maintenance of functional farms for a proper exploitation of natural resources and for land and landscape protection; the qualitative

improvement of production (the Murazzano PDO cheese) as a necessary condition for the maintenance of an adequate income for farmers; an educational programme targeted at farmers to be carried out in representative farms that will be reorganized by means of sustainable system (rational grazing). Recent experience in Val Germanasca (Torino province) has underlined, after two seasons of summer pasturing, a remarkable containment of weeds and shrubby species, a good composition, overall a more pleasant visual impact of the area, a reduction of fire and hydro-geological risks, and a consequent positive effect on tourism.

3 – Oropa Red Pied dairy cattle

Oropa Red Pied is a local dairy cattle breed, selected from Valdostana Red Pied and bred in Biella province. Small herds are also bred in other alpine valleys, together with Brown Swiss cattle. The present number of Oropa R. P. (more than 5000 animals) is slightly increased since 1990, when animals numbered less than 4000.

This breed is still considered vulnerable, and funds from Regulation EC 2078/92 are given to breeders. In the alpine valleys of Piemonte, milk from dairy cows (Aosta Red Pied, Oropa Red Pied, Brown Swiss) is diffusely transformed into "Toma", a DPO cheese of Piemonte. Recent studies on breeding systems and product quality of Oropa Red Pied and Brown Swiss dairy cows indicated some significant differences in fat composition of the autochthonous breed milk (higher values of C18:2 n=6 linoleic acid; C18:3 n=3 linolenic acid; and total Omega 3 and PUFA). As a consequence the proposal of transforming Oropa R.P. milk into a differently labelled "Toma" cheese (i.e. showing the origin of milk) could be useful in increasing the value of this local breed.

Conclusion

From the analysis of the actual productivity of these typical breeds of Piemonte territory arise strong reasons to stimulate and maintain livestock in these areas, simultaneously safeguarding the autochthonous populations.

These breeds have productive and economic functions: production of milk, cheeses and other derivates (e.g. butter and cottage cheese), meat and wool, but an ecological and landscape role for the maintenance of natural environment too.

Besides the safeguarding of rustic races, even if presently commercially less competitive, a proper production of typical products with good qualitative characteristics will help in maintaining regional biodiversity.

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Section 4

Items marked * are included as summaries or full texts in this section.

SESSION 4 A European perspective on agriculture policies, nature conservation and livestock systems.
Chair: *Pernilla Ivarsson, Sweden*

13.30 The European Commission's perspective on the livestock sector.
Michael Hamell, DG Environment, European Commission
14.00 EU hygiene and veterinary regulations: another attack of bureaucracy or a real new approach?
Erik Schmid, Austria *
14.30 German rural development plans and their impact on the less favoured area stock systems value.
Rainer Luick, Germany *

15.00 Coffee

15.30 The livestock sector in the CEE – lessons for rural development policy during market liberalisation. *Jan-Erik Petersen, UK* *
16.00 A case study from Triglav National Park, *Marija Markes, Slovenia* *
16.15 Elaboration of the Netherlands-supported Avalon programme in central and eastern Europe, *Martien Lankester, Netherlands* - complemented with details in poster presentations *
[Poster: Dehesa grasslands: natural values, threats and agri-environmental measures in Spain
Begoña Peco, Juan. J. Oñate & Susana Requena *]
[Poster: Scottish Natural Heritage - Agricultural Demonstration Project
B. Bremner *]
[Poster: ELPEN - European Livestock Policy Evaluation Network: Development of a livestock policy decision support tool *]
16.30 General discussion

17.00 End - opportunity to view posters

19.00 Leave for dinner at Ballyvaughan

EU-Hygiene and Veterinary Regulations: Another attack of Bureaucracy or a Real New Approach

by Erik Schmid

Erik Schmid, Veterinary Official, County Vorarlberg, Austria

A quick look at the Commission Green Paper on the general principles of food law in the European Union gives an idea about the key-points of the hygiene and veterinary regulations we have to expect in the near future. The principles of simplification of community food legislation, high standard food and health safety respecting the complexity of the food chain from stable to table, as well as the benefits of general provisions and voluntary regulations such as production standards and GMP to detailed harmonization, can only be reached by the use of HACCP concepts, risk assessment and health monitoring systems.

For intensive (industrialised) livestock and production systems the new concept should be state of the art. Under the provision of undividable hygiene requirements for intensive and extensive production systems these have a disadvantage because of their worse cost/benefit effect. Also the documentation needed is nearly impossible to manage for small production units. Under these aspects high quality production of safe food seems to be impossible for extensive producing LFA`s, which I prefer to call EFAs (Environmental Favourite Areas).

Unfortunately the modern strategic concepts of the European Commission have to be implemented by the member states using their old-fashioned (but proven) food safety (control measures at the level of final product) and disease control (eradication) programmes. The gap between deficit of implementation and requirements of quality assurance is getting bigger and bigger, and threatens the functionality of the Competent Authorities.

On the other hand, the experience with BSE and Dioxin shows clearly that the risk of damage is disproportionately higher in intensive production units because health risk –like any other risk – is the product of probability of incidence and amount of damage. The probability of incidence may be very low, but the resulting amount of damage is nearly infinite, whereas the risk in extensive producing units with traditional handcraft production is much smaller (probability of incidence may be higher, but damage is much smaller), also due to personal responsibility. In connection with the newly confirmed precautionary principle, the production of traditional food in EFAs has a good chance to compete successfully with industrialised products (even without respecting aspects of empathy of consumer expectations to local products).

But to ensure that the real new approach does not alter into another attack of bureaucracy we have to find:

- new and suitable strategies of implementation within the member states
- more personal responsibility instead of new legislation
- a new approach to the need for consequent documentation for alternative production
- a new definition for quality respecting the way of production
- new pride in tradition and
- identification of region and product

German Rural Development Plans and their impact on the less favoured area stock system value

by Rainer Luick

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There has been a growing awareness since the early 1970s that biodiversity is declining. Despite this, and due to a lack of political measures at that time, nature conservation in Germany was limited to observation, monitoring and criticism. A first positive step that was taken was an increase in the number of areas of ecological interest that were declared as nature reserves. However, subsequent investigations revealed that a statutory status alone was not sufficient to maintain threatened habitats nor to preserve endangered species.

Not until as recently as the late 1980s did an emerging change to the CAP guidelines begin to recognise that national financial resources should be allocated towards nature conservation matters. This money was mainly spent on encouraging the extensification of currently intensive agriculture and for specific nature conservation management measures. But this important strategic change was still limited to relatively few sites of special ecological interest.

In more recent years the discussion on nature conservation is increasingly focussing on large-scale and ecologically oriented land management options, aimed at restoring biological value in the context of agricultural processes. This strategic change was supported and propelled by programmes such as the EU-agri-environment programmes, or LIFE and LEADER.

In all German *Länder* various rural development projects have begun. At present some 300 projects can be found. Their common objective recognises that it is not enough to foster ecological and extensive production; it is also necessary to set up and support structures for regional and local marketing. Such initiatives are mainly found in Less Favoured Areas. Many of these are grassland-dominated regions where the marketing of extensive beef and sheep is of great concern.

In general three strategies of how rural development initiatives have been implemented can be distinguished:

1. **Bottom up approaches:** Awareness of structural disadvantages in LFAs lead to locally organised production and marketing initiatives. Projects are maintained and driven by local people.

2. **Top down approaches:** Because of the availability of funding, institutional interest generates model projects. Projects operate as a mix of locally and governmentally recruited staff.

3. **Scientific approaches:** Here the objective is to develop in-situ. like rural development strategies. Intellectual interests confront local problems.

In this paper examples and experiences of rural development projects focussing on production and marketing of extensive livestock regimes in South-western Germany are presented.

Developments in the CEE Livestock sector – Problems and Opportunities

by Jan-Erik Petersen

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General livestock trends

Structural changes and the liberalisation of agricultural policy have led to a significant decline of livestock numbers and profitability in all applicant countries. Between 1989 and 1997 livestock production in CEE fell about 40 per cent. Cattle numbers declined by 44 % and sheep production by 54 %, whereas pig, poultry and dairy production fared better.

Environmental impact

The decrease in livestock production has had positive and negative effects on the environment. The break up or abandonment of very large collective livestock production units has eased water pollution problems from agriculture in all applicant countries significantly. Considerable efforts are being made to modernise the remaining units and to improve their waste management. On the other hand, many semi-natural grassland systems in CEE depend on continued grazing management. Unprofitable beef and sheep production has led to the abandonment of marginal livestock systems with negative consequences for animal and plant diversity. An IEEP survey among CEE experts showed this to be one of the most pressing concerns for nature conservation on farmland in CEE.

Problems for extensive grazing systems

Important factors for the decline of extensive grazing systems in the EU are their lack of economic profitability, difficulties with easing labour-intensive tasks through mechanisation, and the relative lack of social services in many remote communities. These factors also play a crucial role in the applicant countries, and are reinforced by the difficulties in (re) building livestock enterprises during times of great economic and political uncertainty.

Political support instruments

Extensive grazing systems in the EU benefit from the variety of CAP policy instruments, although sometimes less so than more intensive livestock production systems. The support measures include LFA support, headage payments, investment aid, agri-environment schemes, rural development programmes, (specialised) advisory services and subsidies for important social services such as health care, schooling etc. In CEE many of these support measures are not (yet) in place, due to the difficulties of economic and political transition during integration into the EU.

Outlook for the applicant countries

Rural areas in CEE often face particular economic difficulties, especially where they combine low productivity with remoteness from consumer markets. Although there is a desire to re-build old (pre-war) farming traditions and to avoid the environmental mistakes of the Soviet system, most of these attempts are likely to fail without adequate economic and political support. Practically all applicant countries already have some support measures in place although these command less financial resources than in the EU. Straightforward farm support (linked to environmental conditions) will remain very important for the foreseeable future, to compensate for the economic disadvantages of extensive grassland systems. Agri-environment schemes are another key measure to maintain the special characteristics of low input livestock systems. Targeted rural development support, however, needs to complement and replace other support measures to avoid long-term dependency on support payments. The possibilities for rural development vary between and within all applicant countries. Examples of WWF projects in the Baltic States show, however, that even limited support which involves the local inhabitants can aid low input grassland systems considerably.

A case study from Triglav National Park, Slovenia

by Marja Markes

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Triglav National Park is situated in north-west Slovenia, near the Italian and Austrian state borders. It covers 4.1 % of Slovenia's area. Triglav National Park (TNP) has been partially protected by way of special agreements and laws for 70 years. Since 1981 these have related to its present size (84000 ha). It covers almost all the Slovenian part of the Julian Alps. It includes parts of 6 municipalities and reaches into two regions, Primorska and Gorenjska. In Triglav National Park, 2000 inhabitants permanently live in 25 settlements. The National Park attracts around 2 million visitors per year.

The Park Authority controls violations of the Triglav National Park Act and takes care of nature protection, research, education, wildlife management and the infrastructure. Currently, the Park Authority is a consulting body for physical planning, regional policy, rural development, agriculture and protection of natural and cultural heritage.

A successful development of municipalities within the Triglav National Park and the Park itself is inseparable from the conscious choice of an integral approach presenting the principle of man's actions in relation to both development issues and nature. This can be achieved only through an integral concept which establishes a connection between different environmental interests and activities – economic, cultural, social, and those relating to nature protection. The underlying principle of development activities should therefore be the search for models of efficient, premeditated and environmentally sound use of regional, natural and economic resources, to which the concern for the environment is the primary source of activities. Preservation and the permanent value of natural resources are thus the core and the essential element of development.

. It should be noted that in mountain and hilly areas development can be only successful when considering all aspects of life and work and when the programmes are based on the nature protection principles and use the advantages (while not forgetting the disadvantages) of individual areas –the development of which, in short, finds correct solutions for individual problems.

Agriculture plays a multiple role, and as a constituent part of development programmes is of special importance to country areas. The functions of agriculture are not limited merely to production and direct economic purpose. Just the opposite – agriculture is highly important also because of its social value and the impact it has on settlement culture and nature conservation.

Successful development of country areas can be achieved if the local inhabitants are provided with an attractive environment to live and work in. Satisfying income and suitable job positions are of key importance. Therefore it is necessary to:

- provide and maintain job positions in country areas (on the farms and in the surrounding areas)
  -in agriculture and forestry
  -by developing supplementary activities (processing, tourism, craft, catering)
  -by developing additional opportunities for getting a job in the country (organising the sales of agricultural crops and produce, service activities, guiding..)
- encourage ecologically appropriate methods of agricultural production and processing – organic farming
- introduce direct payments – ecologically, economically and socially motivated direct payments are a means to a satisfying total income
- develop trade-marks for mountain and hill areas, and regional trade-marks (the Triglav National Park trade mark)
- consider the socio-cultural diversity and ecological potential of the territory together with the quality of life as being important elements of integral and permanent development, and to encourage and preserve local and regional self-confidence.

Long-term policy measures for rural areas are crucial if the development strategies are to succeed. A suitable legal basis, which would ensure a long-term security for people living and working in rural areas, would also contribute to higher agreement of the people to development decisions and related risks. Furthermore development programmes should concentrate on the needs of the local people so that the people can identify themselves with and benefit from the development programmes

Dehesa grasslands: natural values, threats and agri-environmental measures in Spain

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Introduction

Over the centuries, the Mediterranean basin grasslands have adapted to human and livestock action, which have formed particular patterns of low-intensity land use that are well adapted to the local limitations of the environment. A good example of these agro-ecosystems are some of the holm and cork oak open woodlands on the Iberian Peninsula, known as *dehesas* in Spain and *montados* in Portugal. Their importance on a pan-Europe scale has been acknowledged due to their size[1] (over 2 million ha on the Iberian Peninsula) and their importance for the maintenance of biological and cultural diversity (Joffre *et al*. 1988, Ruiz 1988).

Dehesas were formed by opening the mainly evergreen woodlands of holm oak (*Quercus ilex* spp. *ballota*) in areas on nutrient-poor and often shallow acidic soils which suffer a severe moisture deficit in summer. In areas with more benign soils and climate, the predominant species is *Q. suber* (cork oak). The vegetation structure consists of a tree layer with a density of 40-100 trees per ha, and a herbaceous stratum. The herbaceous layer is mainly dominated by annual species, particularly legumes and other palatable species adapted to grazing. On a landscape scale, these open forests are mixed with scrubland, generally associated with steeper hillsides or successional stages linked to a low-density grazing and low-intensity cereal cropping with long rotation cycles.

Dehesas are multifunction farming systems used for grazing, sylviculture and rotation cereal cropping. They are mainly grazed by sheep, pig, cattle and goats under an extensive regime that includes transhumance stock movements between summer and winter pastures. The most fruit productive trees are pruned to remove infested branches, broaden their canopy cover and increase acorn production. Acorns and leaves are also used as livestock fodder during dry periods. Cork production in *Quercus suber* dehesas is also an important source of income. Many dehesas are ploughed occasionally for scrub control, and low input cereal cropping is practiced for supplementary livestock and game feeding. Scrub zones have been used traditionally for game management and charcoal is still produced.

This multifunctionality requires very few (if any) chemical inputs, revealing its fine-tuning to the limitations and fluctuations imposed by the physical and biological environment. Although *dehesa* productivity is low in comparison with modern intensive forms of agriculture, it is useful as an inspiration for agri-environmental policies aimed at maintaining or promoting farming practices that are compatible with nature conservation. *Dehesa* systems support a wide diversity of plant and animal species. Particularly significant are the bird communities (Díaz *et al.* 1997) and butterfly species (Viejo *et al*. 1989), many of which are included in European and world-wide endangered lists. Besides, *dehesa* grasslands have been described as being amongst the richest plant communities in Europe, with up to 30 spp. found in 20x20 cm plots (Pineda *et al.* 1981) and up to 130 spp. per 0.1 ha (Marañón 1985). At the landscape level the emerging pattern is enriched with a network of stone walls, hedgerows and traditional buildings, forming a remarkably stable, diverse and sustainable production system adapted to local constraints.

Like many other agro-ecosystems, however, *dehesa* have been subjected to a two-pronged process of intensification and abandonment in recent decades that is threatening their biodiversity. This paper initially reviews the main factors responsible for grassland diversity at a local and a landscape scale, and then isolates the main threats to these farming systems mainly arising from changes in farming practices and management. The adequacy of the implemented agri-environmental measures for *dehesa* grasslands is then examined in terms of their general design and specific commitments with a view to assessing their effectiveness for the conservation of the natural values maintained by *dehesas*.

[1] Dehesas are not listed as a specific land use category in official statistics except in the Extremadura Autonomous Region. Estimates of the total area covered thus vary depending on the criteria for cross-referenced land use and vegetation categories used by different authors.

Factors related to grassland diversity

The high species richness of dehesa grasslands is probably the result of their broad time and space heterogeneity, both natural and human-induced, as well as their long grazing history.

Climate
The long summer drought in the Mediterranean is largely responsible for the annual features of most species in *dehesa* grasslands. Herbaceous species die off every year at the end of spring after seed production, and the grassland regenerates later following the first autumn rains. Their seed banks are mainly transitory, *i.e*. most seeds germinate in the autumn after the summer precipitation gap. However, it has been found that almost 50% of species have some degree of persistence, and at least a fraction of the seeds are capable of remaining viable in the soil for more than a year (Ortega *et al.* 1996).

Another feature of Mediterranean environments is the interannual fluctuations in the amount of rain and its distribution over the year. This variability, along with the latent persistent species in the seed bank, operates as a diversity generating mechanism: the coexistence of species with different germination requirements is allowed (Espigares & Peco 1993), each showing different responses to drought episodes during the seedling establishment stage (Espigares & Peco 1995). Permanent plot monitoring has revealed that fluctuations in the floristic composition linked to precipitation are superimposed on the successional trend. Models of floristic composition dynamics and species richness in *dehesa* grasslands suggest that annual and autumn rainfall, topography and successional age since last ploughing are the most important variables all of them with a high predictive power (Peco 1989, Peco *et al.* 1998).

Topography
Due to the limited water and nutrient supply, the undulating relief where dehesas are usually found is also a source of diversity. Slope aspect and the concatenation of well drained ridges and depressions connected by local surface and subterranean flows of water and nutrients, all influence the floristic composition, the productivity and the phenology of the plant communities (González Bernáldez 1981; Peco *et al*, 1983a). Groundwater discharge points connected to regional flows also influence the geochemistry and water availability hosting permanent meadow communities (Bernáldez *et al.* 1989) extremely valuable due to their rarity and diversity.

The phenological and production variability generated by topography and surface and groundwater flows have been internalised by farmers since time immemorial. Traditional managers have designed *ad hoc* complementary usage systems in space and time, carefully planning the location of gates, watering, salt and stock feeding points, stock shelter management, etc.

Occasional ploughing and itinerant cropping
Another modelling factor in these grasslands is that they have been subject to periodic tilling and very low-input cereal cropping to prevent invasion by scrub, supplement stock feeding and encourage game. Ploughing produces a constant rejuvenation in the grasslands and a mosaic of plots with different ages since the last tillage. The induced secondary succession is characterised by changes in the floristic composition and the structure of the community, generating further diversity both at the grassland plots and landscape levels.

As succession advances, the number of species and the local diversity increase. The spatial distribution of the species across the slopes is not constant over time with a segregation between communities taking place. There is a decrease in the mean niche width and an increase in the number of specialist species (Pineda *et al.* 1981, Peco *et al.* 1983b). After ploughing, the relief produced by tillage is what determines the vegetation structure (Sterling *et al*, 1984), while slope geomorphology becomes more important as succession advances (De Pablo *et al.* 1982). The phenological behaviour of species also varies with succession from a phenological synchronism in the early stages to a segregation of phenological niches in more advanced ones. During succession, the phytomass and production have also been found to concentrate in the low parts of slopes but to spread uniformly over the slope after ploughing (Casado *et al.* 1985).

Analyses of the seed banks in these communities in relation to ploughing frequency and intensity (Levassor *et al.* 1990) have revealed that the number of species and density are maximum at intermediate levels of disturbance. The transitory seed content is extremely high, making them sensitive to changes of use since mature systems are hard to recover from the seed bank if the ploughing frequency increases.

The effect of trees
Due to microclimatic, geochemical and ethological causes, trees generate diversity in the mosaic of the dehesa systems (González Bernáldez *et al*, 1969).

Tree cover has a heavy microclimatic effect by buffering radiation and lowering wind spin at ground level. Besides, individual trees modify the water balance of the system introducing a spatial variability in water resources (Joffre & Rambal 1993). Animal dung accumulates around trees where the livestock seeks shade. The extensive root system of the holm oak enables nutrients yielded by dead leaves and dung decomposition to be pumped from inaccessible depths for the herbaceous vegetation. All of these factors help

to increase the fertility and hence the productivity of the plant communities installed there, which are clearly different from those in open grasslands.

The holm oak trees have been selectively improved for acorn production since Neolithic times, leading to the propagation of trees with larger fruit, less tannin and a lower production of male flowers. Pollen record analyses show that holm oak distribution area has also been expanded artificially (Reille *et al*, 1980). Planting the acorns from the best trees and protecting them from herbivore consumption was a traditional practice, which together with the long-term abandonment of certain areas, ensured the persistence and expansion of the tree cover.

Grazing

Grazing animals are generally thought to enhance diversity by means of the direct consumption of competitively dominant plant species as well as by indirect effects such as trampling or dunging that create small-scale heterogeneity (Crawley 1983). Livestock are also an important intermediate and long-distance dispersal mechanism through dung (Malo & Suárez 1995), hoofs, hair and wool (Poschlod *et al.* 1998). Recent reviews of the effects of grazing animals (Olff & Ritchie 1998) have shown that these effects vary depending on the environment, type and density of herbivores and spatial and temporal scales. For instance, grazing mammals are thought to increase diversity in more productive areas such as temperate grasslands in Europe; meanwhile, in arid or extremely saline environments, they often do not change or may even decrease diversity. Grazing animals managed at low stocking rates can increase plant diversity, while high stocking rates can produce the opposite effect. The optimum levels differ according to the environment and the type of animal. The effect also seems to depend on the evolutionary history, which has permitted the selection of species that can avoid or tolerate herbivory (Naveh & Whittaker 1977), and on the time and space scale of observation.

Both overgrazing and abandonment have negative effects on species diversity, at least at a local scale. In overgrazed zones, excessive fertilisation causes the replacement of species-rich oligotrophic communities with poorer communities associated with artificially N-enriched soils. In extreme cases, overgrazing can compact the soil, causing the almost total elimination of the vegetation cover and erosion problems (Bernáldez & Peco 1991).

Grazing abandonment can produce up to a 70% change in floristic composition (Traba *et al.* 1999), from communities dominated by prostrate species, legumes and rosetas to others with upright-growth species. Coarse grass facies are extremely sensitive to fire, which is usually followed by scrub encroachment. Typical highly palatable grassland species such as many legumes are lost, even from the seed bank. Despite these enormous changes in the floristic composition, short and long-term studies of grazing abandonment have only detected declines in richness at a local scale.

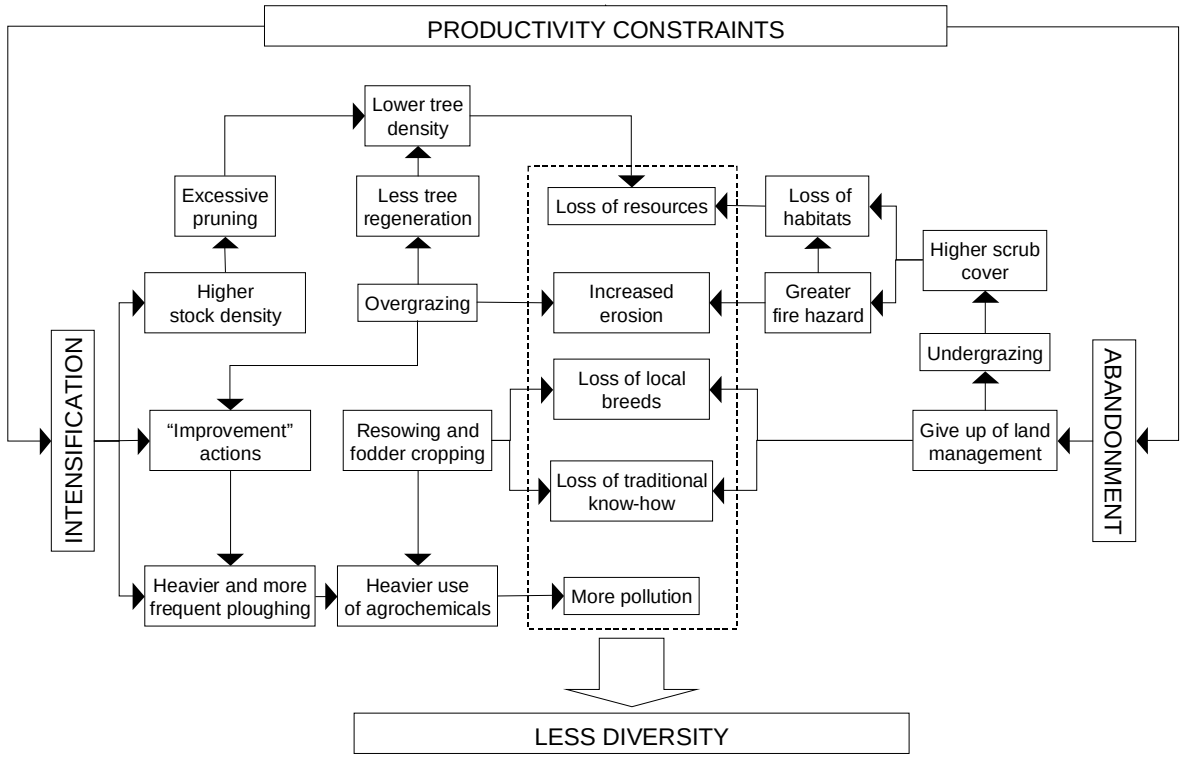

Figure 1. Cause-effect chain of the intensification/abandonment process in the *dehesa*. "Diversity" and "productivity" can be interpreted broadly to encompass biological, landscape and cultural dimensions (diversity) and agronomic production as well as other possible outcomes in the context of rural development opportunities (productivity).

While the scrub communities that replace ungrazed grasslands also have a considerable level of richness, there is no doubt that the homogenisation of the landscape and the loss of open pasture communities produces a reduction in diversity at a landscape scale, also detected in other Mediterranean grasslands (Naveh 1974).

One of the features of livestock management in *dehesas* has been the need for an exclusively seasonal use. This involves moving the herds between and within regions to overcome the low productivity and the severe summer drought in which most grassland species are reduced to seeds. *Dehesas* were traditionally used in seasonal combinations with mountain grassland and grazed steppes, moving herds of local breeds from one to the other in long-distance (transhumance) and more local movements (transtermittance). This was possible thanks to the organisation of a large network of livestock routes (*cañadas*, *cordeles*, *veredas* and *coladas*) that are now only used occasionally for transhumance (Ruíz & Ruíz 1985). In addition to medium and long-distance livestock movements, there are internal movements on farms aimed at adapting consumption to local differences in phenology and productivity and to fertilise each field with dung.

Threats to dehesa systems

Dehesa systems are affected negatively by the same dual intensification/abandonment process suffered by many of the extensive farming systems on the Iberian Peninsula in recent decades. The ultimate causal factors of these changes are related to socio-economic trends at the national, regional and local scale (Peco *et al*. 2000). The two trends and their effects often coexist in small-scale areas and even on a single farm, making it all the more difficult to analyse and monitor the *dehesa* environmental quality (Peco *et al*. 1999).

Dehesa intensification specifically involves a series of management decisions, which paradoxically are aimed at improving their intrinsically low productivity (Fig. 1). In most cases, the most probable final destiny of the former *dehesa* system is the transformation of semi-natural grasslands into mechanised cereal and legume crops of varying intensity, or changes from extensive grazing to livestock husbandry based on grain supply. *Dehesa* abandonment, on the other hand, involves the cessation of grazing, crop rotation and tree canopy management (Figure 1). The environmental effects of abandonment begin with the loss of palatable species that are adapted to grazing and the invasion by scrub. In addition to this loss of diversity on the local and landscape scale, there is an increased fire hazard due to the excess of accumulated biomass and the subsequent risk of erosion.

Both intensification and abandonment are accompanied by an irremediable loss of traditional farming know-how. Three of these customs are particularly crucial to the working of the system: i) tree layer conservation management and active regeneration techniques, which compensate for the almost total lack of natural regeneration due to grazing; ii) awareness of the space-time distribution of the pasture carrying capacity on the farm as a basis for the differing space-time organisation of its usage; and iii) organisational models of grazing and seasonal resource usage embodied in transhumance and transtermittance.

The loss of the cultural heritage and know-how involved in traditional *dehesa* management exacerbates the loss of biodiversity caused by intensification and abandonment. The result is an impoverishment of the rural environment and landscape, threatening future opportunities for *dehesas* under the Agenda 2000 framework.

Agri-environmental measures and dehesas

The Spanish agri-environmental programme has been described and analysed in detail elsewhere (Oñate *et al*. 1998). Despite the environmental and geographic importance of the *dehesa* in Spain, only one agri-environmental scheme explicitly targets this unique

Table 1. Andalusia Dehesa Conservation Scheme
Applicable rules

- No ploughing is allowed in areas with >10% slope angle and tillage of pastures should be restricted to particular cases of pasture restoration.
- Soil loss and erosion processes (gully formation, landslides, etc.) must be prevented using the appropriate techniques.
- Riparian vegetation 5 metres on either side of riverbanks must be protected from ploughing and the riparian habitat must be preserved from dumping that may pollute the water quality.
- Tree conservation (pruning, clearing, underthinning, shoot removal) and active regeneration must be performed in adequate way and timing. Tree felling is forbidden and fire prevention techniques must be applied when appropriate.
- Stock density must be established according to the circumstances of each field in order to avoid infra- and over-grazing.
- Landscape elements such as stone walls, traditional rural buildings, hedgerows and high natural value woodlots must be preserved.
- Negative impact from accumulated dung, rubbish or new installations must be prevented. Traditional architecture must be preserved in all new buildings.

system.

Andalusian *dehesas* with extensive pastures on more than 40% of the farm and extensive livestock accounting for more than 50% of the total LU are the target of the specific Andalusia Dehesa Conservation Scheme, implemented in April 1999. Its design acknowledges the range of aspects involved in the maintenance of the environmental and productive values of the *dehesa* and thus stipulates that the farmer must elaborate and submit for approval a Management Plan for the farm. An integrated set of aspects must be considered in this plan (Table 1). A basic payment (120 Euro/ha) can be complemented with specific premiums depending on particular commitments, e.g. conversion of arable land into pastures on areas with >10% slope, (150 Euro/ha), pasture restoration (30 Euro/ha), erosion remediation (30 Euro/ha), tree regeneration with *Quercus* and *Olea* species (66 Euro/ha), conservation of landscape elements (30 Euro/ha), management for public access (30 Euro/ha). A total of 12,000 ha are expected to be included in the scheme.

The Andalusia Dehesa Conservation Scheme contrasts sharply with others that are applicable to extensive grasslands but do not explicitly target *dehesa* systems. Five schemes containing measures which target extensive grasslands are being implemented in areas where *dehesas* could potentially be covered. In fact the four Spanish Regions with significant *dehesa* areas (Andalusia, Castilla-León, Castilla-La Mancha and Extremadura) are all currently implementing grassland schemes that could provide benefits to *dehesa* systems. These schemes are being applied in National and Natural Parks (Doñana, Cabañeros, Monfragüe), SPAs under the EU Birds Directive (in Extremadura and Andalusia) and mountain areas (in Castilla and León). Each of these schemes may contain some of the independent (and incompatible) measures (Table 2).

Assessment

The *dehesa* agri-environmental schemes can be analysed at three levels: i) design and implementation; ii) results of implementation; and iii) environmental effects and outcomes. The first level is used here since data availability on uptake by farmers is fairly limited at the moment and it is still too early for a serious analysis of the effects.

Spain is fortunate to still have large areas covered by *dehesas*, which would be highly suitable as examples for the promotion of sustainable development in many farming areas of the Mediterranean basin. Paradoxically, the country with the greatest representation of this valuable agri-ecosystem currently only has one scheme that specifically targets *dehesas*.

Table 2. Design of agri-environmental schemes targeting extensive grasslands

Measure	Scheme	Commitments				
		Conversion to pastures	LU/ha	Book keeping	Grazing timetable	Others
Conversion of arable land into extensive grasslands	Doñana National Park (Andalusia)	> 5% of cropping area (>1 ha)	0.3-1.4	Yes	Yes (seasonal)	
	SPAs (Andalusia)	> 5% of cropping area (>1 ha)	< 1.4		Yes (seasonal)	Pasture restoration (event.)
Stocking density reduction	Doñana National Park (Andalusia)		0.5-0.25	Yes	Yes (seasonal)	
	SPAs (Andalusia)		< 0.5		Yes (location and seasonal)	
	SPAs and Monfragüe Natural Park (Extremadura)		0.25-0.5		Yes (location and time)	
Countryside and landscape maintenance and fire prevention	Cabañeros National Park (Castilla - La Mancha)		0.15-0.5			Manual scrub clearance if slope < 12% Regulation of communal pastures usage
	SPAs and Monfragüe Natural Park (Extremadura)		0.15-0.5	Yes	Yes (seasonal)	Mechanical or manual scrub clearance Regulation of communal pastures usage
	Fire prevention in mountain areas (Castilla y León)	Some abandoned *dehesas* can benefit from manual or mechanical scrub clearance				

The specific interrelationships between farming practices and biodiversity are relatively well known in the case of the *dehesa* systems, and thus it would be possible in most cases to define management objectives for these habitats and landscapes. The main natural and management-derived factors affecting biodiversity have proven to vary at a quite local scale and all fit into a delicate network of interactions with variations in time and space.

Effectiveness should therefore not be expected from general types of measures such as maximum or minimum stocking density limitations. Only if their stipulations are specified and adapted to each individual situation, or supplemented with others linked to the remaining decisive factors (e.g. tree layer management, erosion control or the conservation of natural habitats), conservation effects will be achieved. The appropriate stocking density is perhaps the most striking example. Its correct space-time definition requires a specific analysis not only of each *dehesa*, but also of the complementary usage of the *dehesa* and other extensive grasslands, including the resumption of transhumance and transtermittance.

The Andalusia Dehesa Conservation Scheme is an example of a good design. Through a management plan, it permits the introduction of both general commitments and particular ones under an integrative approach. This allows their specification and detail in each case depending on the local conditions. In consequence, their environmental effects are more likely to be achieved. However, the mechanisms for evaluating the environmental effectiveness of the scheme are not specified. This produces an excessively broad degree of uncertainty in terms of the suitability of the management plan. In addition, the measure does not specify the need for a single seasonal use of the *dehesa*, nor any support for transhumance or transtermittance. This will most probably lead to the use of supplementary stock feed on the *dehesa* during the summer drought, which will increase the risk of over-grazing, erosion and soil compacting.

In other regions, the inflexibility and lack of integration of the general schemes that target grasslands makes it difficult if not impossible to adapt them to the dynamics of systems with complex interrelationships such as *dehesas*. Thus no significant effects in nature conservation can be expected from its application.

Conclusions

- Although the main processes are known, the specific interrelationships between natural and management factors and biodiversity should be further studied and clarified in each region.

- Specific agri-environmental schemes targeting *dehesa* systems should be designed and implemented in a decisive manner in the affected regions, emphasising:

  - Not only the rehabilitation of *dehesas* affected by intensification or abandonment, but also the conservation of those that are still in a good state.
  - The desired flexibility in the application of the commitments to local conditions could be achieved with the design of a specific management plan for each *dehesa*, including the seasonal use of pastures and encouraging livestock movement between areas with different phenology.
  - A link between the system management and biodiversity outcomes focused on achieving the forthcoming EC-Agricultural Biodiversity Action Plan targets.
  - The recovery and dissemination of traditional management know-how and the reinforcement of biodiversity expertise amongst farmers and advisers.

- Finally, an additional priority must be the development of operative evaluation tools for monitoring and assessing the effects and outcomes of the agri-environmental measures.

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Scottish Natural Heritage - Agricultural Demonstration Project

by B. Bremner

B. Bremner, Project Officer, Scottish Natural Heritage, Main Street, Golspie KW10 6TG, Scotland.

This demonstration project, which was set up in 1994, was outlined at the start in the proceedings from the fourth European Forum *Farming on the edge: the nature of traditional farmland in Europe* (1995). The five-year management programmes have now been completed. Individual projects showed how environmental management could become an integral part of agricultural operations while at the same time providing additional benefits for the people living there.

Four demonstration locations were selected by Scottish Natural Heritage (SNH) in its North Area to identify agricultural practices which maintain and enhance the environment and, to evaluate associated costs. These were - Skerray crofting township*, Sutherland; Ross farms, Ross -shire; Glencassley farm, Sutherland; and Garros crofting township, Skye. The projects were initiated over a sixteen month period to allow detailed consultation with all those involved.

Management

Five-year plans were drawn up in discussion with the farmers and crofters. These give an overview for each project area, detail the management proposed within each unit, and identify the practical measures and support required to carry it out.

In return for annual payments, farmers and crofters undertook to adhere to an environmental code and keep detailed records of all management. Payments were also made for additional activities or capital works that benefited wildlife and landscape. A total management budget of £175,000 was paid out over the five years.

Monitoring

Baseline botanical and landscape surveys were carried out in 1994 and repeated at the end of each project. A bird survey was also carried out over winter 1999/ 2000. A social survey was commissioned to identify benefits from the project and determine the level of interest among participants and local communities. "The attitude and awareness research has shown that the Agricultural Demonstration Programme has been well received and appreciated by those who participated" (Macpherson Research 1999).

Project Profiles

Garros

Garros is a small township, consisting of 180 hectares of common grazing and 12 hectares of in-bye (agriculturally improved) croft land. It supports a range of important habitats and species. In 1994, the land around the crofts was mainly under species rich grass. The high plant diversity was being maintained by low fertiliser input and a tradition of cutting for hay or silage in August. This continued during the project.

New management focused on grass which had been reseeded and areas which had been cultivated 15 years previously but had since reverted. Rushes (*Juncus sp)* were controlled to vary grassland structure. Crops were introduced to help vary wildlife interest and provide additional feed for livestock. Turnip and oat crops were established. Bare ground provided nesting sites (*Haematopus ostralagus* and *Vanellus vanellus*) and allowed annual plants to germinate. Standing crops provided cover for a range of wildlife and the stubble contained grain, plant seeds and insect pupae - valuable food sources.

Undisturbed margins were also established around fields and beside water-courses as a refuge for plant species, invertebrates, young birds and mammals. Woodlands were extended by facilitating natural regeneration.

Glencassley

Glencassley is a 4600-hectare hill farm with some improved fields and hay meadows along the River Cassley. These are very prone to flooding. The project was set up to demonstrate how an extensive hill farm can be managed in better association with its natural resources.

A cattle grazing/ cutting regime was implemented to improve an area of meadow which was overgrown with rank grasses. Oats were introduced as a break crop in the reseed rotation. Unfortunately the management was curtailed due to changes in the tenancy which highlights the importance of maintaining stable farming systems.

* see Glossary at end of paper

Ross-shire farms
Seven farms including mixed beef/ sheep enterprises and one arable unit took part in this project. Land rises from sea level to 620m and, as geology, soils and climate vary with altitude, consequently so do the farm types and practices. These farms are more intensive than the other project units.

The project area, extending to 2300 hectares, is important in a landscape context as it lies on a prominent south-east facing slope. Work was carried out to restore visually prominent tree-lined field boundaries and other notable landscape features.

Management included increasing the area of root crops grown for sheep. Survey work confirmed that these crops provided valuable cover and food sources for birds (*Carduelis cannabina*, *C. flavirostris*, *Passer montanus* and *Alauda arvensis*) in winter and were especially valuable where they were situated adjacent to cereal stubble. Permanent field margins and hedges were also established to provide refuge areas during agricultural operations and extend the links between existing habitats.

Skerray
The Skerray project involved 17 crofters with a total of 28 crofts covering an area of 60 hectares of in-bye and 1700 hectares of common grazings, about half of the township. The landscape and natural heritage within the area is very diverse and includes coastal grassland, blanket bog and hay meadows.

This project highlighted the importance of community initiatives, showing how local people can contribute to sustainable land use. Much of management carried out under the SNH project linked to other activities in the township.

One of the main aims was to re-introduce rotational cropping (oats, turnips, grass) on the in-bye land as this had declined significantly in recent years. The mosaic of crops delivered environmental benefits but, importantly, it also provided additional feed for livestock. Growing winter fodder reduced costs allowing crofters to keep more cattle.

Activities such as bracken *Pteridium aquilinum* control, repairing paths and clearing gorse *Ulex europaeus* for winter shelter were also carried out. Stone dykes and traditional buildings were restored, helping to maintain skills and amenity value.

Conclusion

Practical problems were addressed as the project progressed and, by having a project officer available during the programme, specific local needs were taken into account.

By working closely with the people in each of the project areas, SNH has been able to identify some of the environmental and community benefits which come from existing agricultural practices in the north of Scotland. By encouraging specific management we have also been able to show farmers and crofters how habitats and species may be supported within their farm /croft routine. A variety of groups have visited the projects and information has been made available to the public and interested organisations.

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Glossary

croft: small agricultural unit peculiar to north and west of Scotland
township: administrative area for groups of crofts

ELPEN - European Livestock Policy Evaluation Network: Development of a livestock policy decision support tool

ELPEN has been approved by the European Commission to be funded under the Fifth Framework Programme for a period of 3 years (2000-2002). In 1997-1998 ELPEN was a Concerted Action project funded by the European Commission, DGVI (Agriculture), (FAIR 3 CT96 1586).
Partners: Macauly Land Use Research Institute (main coordinator) UK, (Contact: Dr. I. Wright (i.wright@mluri.sari.ac.uk) and J. Laker (j.laker@mluri.sari.ac.uk)), DLO- Alterra The Netherlands (Contact: Drs. B. S. Elbersen (Elbersen@Alterra.Wag-ur.nl)), Bundesforschungsanstalt fuer Landwirtschaft Germany, The Danish Forest and Landscape Research Institute, Agricultural University of Athens and YUSE-GSO Object Vision.

Objectives and expected achievements

The overall objective of the ELPEN project is to build a decision support system for appraisal and evaluation of European livestock policy. The system will be integrative, client-oriented, knowledge-based, and spatially explicit and will be capable of assessing potential economic, environmental and social impacts. This will be achieved by the following specific objectives:

a) to use state-of-the-art technology to build a dynamic, knowledge-based decision support system that will be capable of answering specific questions posed by policy makers about the economic, environmental and social impacts of policy related to livestock,
b) to develop a network of experts from different EU countries who have specialist knowledge on different aspects of livestock systems to provide the knowledge needed to build the system and to organise communication between them,
c) to collate biogeographic, technical, economic, environmental and social data on livestock systems throughout the EU,
d) to involve policy makers (the end-users of the system) in the design of the system,
e) to promote interaction between policy makers and researchers.

The need for a livestock policy decision support tool

Within the European Union there is a huge number of different livestock production systems based upon a great diversity of natural and human resources. Livestock production often has a profound impact on the regions within which it is situated, economically, socially and environmentally. In many rural areas livestock production has historically been the mainstay of economic and social activity, supporting large numbers of rural communities and has also been responsible, over centuries, for creating the landscapes and habitats valued by so many. In many marginal areas of the EU this is still the case, although recent years have seen severe rural depopulation in many of these areas, with a parallel decline in livestock numbers. At the same time there has been intensification of livestock production in fertile lowland areas well served by major infrastructure. In these areas livestock production is increasingly associated with deleterious effects on environmental quality associated with increases in pollutant levels in ground and surface water and a decline in the diversity of wildlife. Also forms of pluri-activity in some areas are often based on specific forms of livestock production. One of the challenges facing policy-makers today is how to achieve a balance between the negative and positive economic, social and environmental impacts of livestock production.

There is a continuing need for livestock production systems to adapt to changing circumstances, for example as a result of changes in the Common Agricultural Policy, the World Trade Agreements and changing social and cultural traditions. There is therefore need for appraising the likely impacts of these changes, and for monitoring and evaluating the impacts of policy. However, appraisal and evaluation are often constrained by current research methods, available data and lack of appropriate models. This is especially true when trying to appraise and evaluate impacts on a regional basis. The ELPEN project is therefore designed to fill in this niche in knowledge through building a knowledge system that is capable of appraising the economic, environmental and social impacts of policy. The system must, because of the regional variation in climate, natural resources (soils, vegetation etc.) and social structures and the increasing move towards de-centralisation of policy implementation, appraise the impacts of policy measures not only at a European or National level, but at a regional level. Therefore the requirement is for

spatially explicit appraisal; *i.e.* it is not sufficient for policy makers to know what the impact of a policy change will be, but it is important to know where the impacts will be and how they will vary in different regions.

The project will bring together a range of spatial and non-spatial data sets that are necessary to assess the impact of policy. These will include biogeographic spatial data (soils, climate, topography, land cover etc) and non-spatial data on, for example, farm level data on technical aspects of livestock systems, farm economic performance, environmental organisation, and the relationship of livestock systems to the wider economic and social environment. After the first year of the project the system will be capable of answering only relatively simple questions, but as the project progresses, because the system will accumulate knowledge as it is built and developed, by the end of year three it will be capable of answering relatively complex questions. The development of the system will be steered by both the specific questions posed by policy makers, through the formation of an End-Users Group of EU and National policy makers, and by a Scientific Advisory Committee, the members of which will have a sound and widespread knowledge of European livestock systems. The project will develop a network of experts on different aspects of EU livestock systems, including animal scientists, economists, geographers, sociologists and environmental scientists. This network will represent a unique and formidable amount of knowledge about livestock systems in the EU. It will be used to collect and organise knowledge.

Innovative aspects

The ELPEN system will have the following key features:

1. It will integrate economic, environmental and social impacts
2. It will combine spatial and non-spatial data in a way that will allow regional impacts to be assessed
3. It will be dynamic in that new knowledge can be added to the model at any time, thus providing an extremely flexible tool. Knowledge in the system can also be up-dated as new information becomes available.
4. It will be client-driven, in that the policy makers will determine to a large extent the priority questions to be answered.

Section 5

Items marked * are included as summaries or full texts in this section.

Tuesday 20th June

SESSION 5 The need for a typology of European Livestock Systems

09.00 The 2nd Colin Tubbs Memorial Lecture: The need for a typology of European Livestock Systems. *Eric Bignal, UK* *

09.40 Developing a spatially specific typology of livestock systems in Europe: problems and possibilities. *Berien Elbersen, Frans Godenschalk, Sander Mucher, Marta Pérez Soba & Janneke Roos, The Netherlands and Erling Andersen, Denmark* *

10.00 Taking forward the ideas presented in the Colin Tubbs Memorial lecture: the potential for cooperation on a joint project to produce a typology of livestock systems for environmental purposes. *Led by Eric Bignal & Natacha Yellachich*

[Poster: DMEER, the Digital Map of European Ecological Regions and its use for a typology of landscapes. *Ole P. Ostermann* *]

10.30 Coffee

The 2nd Colin Tubbs Memorial Lecture

The need for a typology of European livestock systems for environmental purposes

by Eric Bignal

Eric Bignal, Kindrochaid, Gruinart, Bridgend, Isle of Islay, Argyll PA44 7PT, Scotland

In his 1997 paper *A Vision for Rural Europe*, Colin Tubbs reviewed how nature conservation philosophy and practice moved from its traditional emphasis on the designation and management of sites to the present situation with a wide range of schemes and policies intended to influence what happens in the wider countryside. Importantly he pointed out that "such initiatives are either defensive rather than positive in application, or still affect only a relatively small proportion of the UK land surface", and that "All have tended to succumb to the management notion, rooted in the conservation movements bread-and butter devotion to site protection, that animals and plants and the habitats they comprise can be seen in isolation from the farming systems of which they are, or were, integral parts."

His comments referred specifically to the UK, but they are applicable in varying degrees to most of Europe, and he pointed to the need for managers and policy-makers to see the organisms and habitats in holistic terms as integral parts of (low-intensity) farming systems.

It was Colin's view that it is the holistic approach that underpins the origins and objectives of the Forum and as such that it's first priority should be the preparation of a European inventory of low-intensity farming systems, building on that described in the *Nature of Farming* (Baldock *et al.* 1994).

Experience on the ground of several years of agri-environmental schemes suggests that perhaps policy is beginning to run ahead of reality; partly because there is no framework for conceptualising and describing farming systems to form the basis for clear targeting of actions. Whilst there are existing typologies of farming systems they are not adequate for environmental purposes and policy is run mainly by using very simple distinctions between farming systems and rather crude thresholds such as number of livestock units or number of hectares. Because of this it is generally impossible to calibrate back to farming systems.

The Agenda 2000 reforms, which introduce a further shift in emphasis of the CAP from production to broader rural objectives, make the need all the more urgent. In the Rural Development Regulation (1257/1999) the scope and objectives specifically mention the promotion of sustainable farming systems and the maintenance and promotion of low-input farming systems. But if you look deeper into European agricultural policy you find a rather contradictory situation. Some measures aim to promote the "European Model of Farming", recognising the social and environmental aspects; others encourage and promote intensification of practices, amalgamation of farms and the need for fewer farms and farmers. This may or may not be intentional, but a typology of farming systems for environmental purposes would help considerably in disentangling these apparent contradictions – and in targeting measures with differing objectives at appropriate areas and farm types. There is also a need for a much tighter description of the linkages between farming and nature conservation (environmental) value because there is a danger that the ecological case for supporting European farming is used out of context in global policy negotiations to justify support for agriculture in Europe generally.

An opportunity to look seriously at how such a typology might be developed presented itself in a desk study looking at the environmental impact of dairy production in the EU (CEAS / EFNCP 2000). A typology was developed to provide a framework for examining the environmental impact of dairy farming and for setting priorities for environmental enhancement. The method involves cross-tabulating categories of production and bio-geographical region with fodder and forage resources (land use categories) to produce 10 Dairy Systems which describe all EU dairy farms. The systems are differentiated by reference to threshold values of agricultural indicators such as fertiliser use, concentrate use, farm size, herd size, milk yield, livestock density and main winter fodder used. A dendrogram shows the linkages between them and a profile of each system describes the management objectives, location, farm structures and forage resources, animal system and feeding system. For each system the number/share of EU dairy cows and milk production has been estimated and systems grouped according to predicted environmental impact. Interestingly, ecologically valuable systems account for only 6% and 8% respectively of EU milk production and dairy cows. The potential applicability of the approach to other livestock sectors is discussed and methods of developing it further are suggested.

Developing a spatially specific typology of livestock systems in Europe: problems and possibilities

by Berien Elbersen, Frans Godenschalk, Sander Mucher, Marta Pérez Soba, Janneke Roos & Erling Andersen

Berien Elbersen, Frans Godenschalk, Sander Mucher, Marta Pérez Soba & Janneke Roos, Alterra, The Netherlands and Erling Andersen, The Danish Forest and Landscape Research Institute, Denmark

Livestock farming have a very important impact on the environment in relation to landscape and biodiversity aspects and have often been a key historical factor for the evolution of specific cultural landscapes. One of the main aims of the ELPEN1 project is to create links between livestock policies, livestock farming practices and environmental characteristics. Firstly, knowledge is therefore needed on the possible environmental impacts of livestock practices. Secondly, a better understanding is required of the effects on farming practices of changes in policies. However, building a typology of livestock systems present in Europe will be a necessary tool to create this link. To do this the typology must be able to link the specific types of livestock systems to specific types of landscapes with specific links between livestock practices and environmental quality. Furthermore the typology must consist of specific types in which the individual farmers can be expected to react uniformly to policy changes.

Central in the ELPEN project is to build a decision support system for appraisal and evaluation of European livestock policy. The system must, because of the regional variation in climate, natural resources (soils, vegetation etc) and social structures and the increasing move towards de-centralisation of policy implementation, appraise the impacts of policy measures not only at a European or national level, but at a regional and local level. Therefore the requirement is for spatially explicit appraisal i.e. it is not sufficient for policy makers to know what the impact of a policy change will be, but it is important to know where the impacts will be and how they will vary in different regions. This means that the type and location of farm types should be known before one can assess the impact of policy measures, especially if the impacts relate to environmental aspects.

In this paper it is investigated how a spatially specific typology of livestock systems in Europe can be created and what problems are encountered during this process. The focus is on European dairy systems since these systems are expected to experience many changes in the future and they are traditionally land-dependent. The European dairy system typology already produced by CEAS and the European Forum for Nature Conservation and Pastoralism (April, 2000) is used as a starting point for a typology. A first attempt is made to combine statistical indicators (from both EUROSTAT and national sources) that are indicative for the different farm typologies, with spatially explicit information. The spatially explicit information used is on bio-geographical location, land cover (CORINE) and altitude. Firstly, a general approach for EU-15 is described. Secondly, the examples of Denmark and the Netherlands are worked out to refine the typology for implementation in policy analysis in general and more specifically in the ELPEN project.

DMEER, the Digital Map of European Ecological Regions and its use for a typology of landscapes

by Ole P. Ostermann

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Background

The Digital Map of European Ecological Regions (DMEER) has been developed between 1995 and 2000 by the European Environment Agency (EEA, Copenhagen) through its Topic Centre on Nature Conservation (ETC/NC, Paris). ETC/NC consortium partners have delivered the two spatial digital data sources for the creation of DMEER: the potential natural vegetation from BfN (DE), and the climatic land classification from ITE (UK). The data crossing and processing was done by ISEGI (PT).

Introduction

DMEER covers pan-Europe up to the Ural Mts. and Turkey with 68 classes. This map is conceived to be the major reporting frame for biodiversity topics (fauna, flora, habitats), as it presents a reasonable number of ecological classes (areas with similar potential for largely homogenous ecological conditions). Differences in biodiversity within an ecological region will call for explanations, whereas differences within other reporting units (grids, countries etc.) are more subject to chance. Most countries for example cover mountains and plains, and extend from north to south or east to west, so presenting large profiles, whereas ecological regions are defined by narrow parameters.

Methods

The original methodology of crossing ITE data (climatic land classification) and BfN data (natural potential vegetation) by GIS was a first and important step towards the DMEER. But the simple mathematical result was not entirely satisfying. A common level of aggregation of the overlay product, leading to an agreed number of classes for Europe could not be found, as it gave too much detail in some parts, whereas others were too merged. So it was decided to further aggregate on experts' advice.

For some areas mainly in southern Europe, this procedure was not able to produce the units that were expected by the experts to show up. In these parts, some units are now purely based on an interpretation of the potential natural vegetation, without mathematical correlation to the climate data-base of ITE. The final agreement was done in collaboration with the WWF global ecoregions project.

Results

The map

The map as shown is the WWF representation. Other than the WWF objective of a conservation assessment of the terrestrial ecoregions of Eurasia, DMEER is proposed as a reporting framework, allowing the evaluation of biodiversity and its assessment on a background of ecological parameters. Accordingly, the terminology of the DMEER classes is more biogeographic and less oriented at the potential vegetation.

Data-base

The available data (for the moment ITE on climate and BfN on natural vegetation, with later others to be agreed - for example soil, but also presence of species and habitats) is projected into the DMEER units, and their contribution to the classes is calculated for inclusion in the database.

The map is meant to be shown as an access to this database on CD-Rom or Internet (www.eea.eu.int), or as hard-copy the appropriate scale is 1:5 mio to 1:15 mio.

Landscape typology

The CORINE land-cover data (CLC) is available for large parts of EU and accession countries. 44 classes had been used to characterise land and water through remote sensing. The minimum mapping unit is 25 ha. Although some points could be improved (updating, minimum mapping unit, definition of merged units etc.), this constitutes for the first time a homogenous data layer for Europe.

The crossing of CLC with DMEER could be a step towards a landscape typology, as CLC brings the human impact, and DMEER the ecological potential of the area.
Statistics by ecological region will show clear differences, explained by both the ecological potential as by the land-use. Mountain areas show more

grasslands and forests, plains more arable lands, and northern areas mainly forests or heathlands. Unfortunately no map on the intensity of human impact (artificialisation) is currently available, but statistics on fertiliser or energy consumption could give a useful hint.

Acknowledgements

The DMEER project was part of the EEA work programme, to be carried out by the consortium of the ETC/NC. A series of experts and scientists from the concerned countries and from European organisations had the occasion to comment on previous drafts. At the latest stage, WWF was involved to coordinate with its Terrestrial Ecoregions project, leading to one corroborating cut-out of ecological regions for Europe in order to avoid confusion. The map noted here is the WWF map.

Section 6

Items marked * are included as summaries or full texts in this section.

SESSION 6 Workshops – Analyses

11.00 Local farmers' statement
11.10 Introduction to the workshops
Davy McCracken
A. Mainstream agricultural support (CMO) and opportunities for environmental enhancement.
B. Lessons from different practical approaches to agri-environmental measures.
C. Integrated rural development – can the ideology be translated into practical measures?
D. Approaches to livestock typologies for environmental purposes.
13.30 Lunch

SESSION 7 Synthesising the conclusions from the Workshops
Chair: *Natacha Yellachich, UK*

14.30 Reports and outcomes from the four workshops.
Led by Davy McCracken & the workshop facilitators
15.30 General Discussion
16.00 Coffee
16.30 Summary of main outcomes, conclusions and recommendations of the meeting
David Baldock
17.00 CLOSE

19.00 Reception in poster area
20.00 Conference Dinner in the Falls Hotel

Wednesday 21 June
Disperse

APPENDICES

Appendix 1: Information on site visits
Appendix 2: List of delegates

Appendix 1: Information on site visits

SESSION 2 will involve a series of field visits to areas in the Burren. The delegates will be divided into four groups, and each group will visit two farms in the region and either the Burren National Park or Keelhilla National Nature Reserve.

The itinerary for the four groups is as follows:

GROUP 1 - O'Donoghue's farm, Rockvale → O'Connor's farm, Monreagh → Burren National Park

GROUP 2 -Davoren's farm, Kilcorney, → O'Dea's farm, Coiscéim → Keelhill National Nature Reserve

GROUP 3 - Nagle's farm, Pollough → McCormack's farm, Glanquin, -→ Burren National Park

GROUP 4 - Kerin's farm, Bell Harbour → O'Dea's farm, Bell Harbour → Burren National Park

Below are some details of the farming enterprises of the farms that will be visited. Also included are brief notes on the Burren National Park and Keelhilla National Nature Reserve.

Delegates will be informed of which group they have been assigned to when registering for the conference. This will help to ensure that each group contains an appropriate balance of experience and wider European representation.

O'Donoghue's farm, Rockvale

Name	John and Carmel O'Donoghue
Locality	Rockvale, Tubber, Co. Clare
Total agricultural land	77.7ha (192acres)
Own land	57.5ha (142acres)
Rented land	0
Grazing rights / commonage	20.2ha (50acres) (in the Burren National Park)
Leased land	0
Special Area of Conservation	77.7ha (192acres)
Composition of land	
Tillage	0
Pasture	22.2ha (55acres)
Silage	14.2ha (35acres)
Winterage*	21ha (52acres)
Agricultural production	Dairy
Cattle	44 Friesians 40 replacement heifers (1-2yrs old), sold at 2 yrs 1 Limousin, 1 Simmental (stock bulls)
Other animals	None
Rural Environment Protection Scheme (REPS)	Joined 1996, used as demonstration farm for REPS. Supplementary measure SMA –NHA supplement

Additional information Over 50% of the improved grassland was reclaimed from rocky land between the 1950s and the 1980s. Twenty-five cattle are kept on the winterage during the winter months and the remainder are housed during December and January each year.

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Michael and Carmel have a grown up family and Michael has contributed enormously to the local farming community, through being chair of the Co. Clare IFA and on most of the National IFA committees over the past 40 years.

O'Connor's farm, Monreagh

Name	Michael and Mary O'Connor
Locality	Monreagh, Tubber, Co. Clare
Total agricultural land	119ha (294 acres)
Own land	0
Leased land	119ha (294 acres) on 21 year lease
Special Area of Conservation	60.7ha (150 acres)
Composition of land	
Tillage	0
Pasture	33.2ha (82 acres)
Silage	25.1ha (62 acres)
Winterage	60.7ha (150 acres)
Agricultural production	Suckler herd, quota for 56 cows
Cattle	56 suckler cows (including 6 1yr-old) – 20 Hereford, 16 Aberdeen Angus, 14 Limousin, 5 Shorthorn 1 Charolais bull
Other animals	120 Suffolk Cross sheep (kept on lowland)
Rural Environment Protection Scheme (REPS)	Joined in 1995 Supplementary measure – none as yet

Additional information 1. Land was mostly reclaimed in 1970s, so soil is shallow and there are few walls to maintain under REPS. Some birch scrub remains on the winterage.

2. The farm is leased for 21 years to 1st March 2015, an unusually long period for this area
3. As Michael has a full-time job, he tries to run a simple farming system
4. Calves born from 1st March and sold at 1 yr, after claiming 10 month premium
5. Lambs born end of March over 1 month period. Sold September/ October as stores
6. Calves and some cows housed in slatted house over winter. Fed on round bale silage
7. 25 cows kept on winterage mid-October to 1st February
8. Approx. 700 round bales silage produced from 60 acres
9. A water supply is piped from a spring on the mountain into 2 holding tanks. A borehole of limited output is available as back-up
10. Pine marten, mink and foxes are a problem in the area. Feral goat nos. have greatly increased over last 2 years, now becoming a significant problem, particularly in bad weather when they come down from the mountain into the pasture.

****

Michael and Mary have a young family and Michael is also involved in the family engineering business. The O'Connor brothers are well-known county-wide for their sporting achievements in hurling.

Davoren's farm, Kilcorney

Name	Michael and Elizabeth Davoren
Locality	Kilcorney, Kilfenora, Co. Clare
Total agricultural land	71.39 ha
Own land	71.39 ha
Rented/leased land etc	0
Special Area of Conservation	54.40 ha
Composition of land	
Tillage	0
Pasture	16 ha
Silage	0
Winterage	54.40 ha
Agricultural production	Cattle & sheep
Cattle	24 Herefords / Shorthorns 4 replacement heifers 1 Limousin bull
Other animals	20 Suffolk sheep plus 6 replacements bred to a Hampshire ram
Rural Environment Protection Scheme (REPS)	Joined in 1995 Supplementary measure: NHA till 1999

Additional information All cattle on the winterage during the winter months and cows usually calve on the winterage in spring. Lambs sold to French market from May onwards (when they reach 40kg). Mr Davoren proposes to replace cow herd with cross-bred Limousine served by a Belgian Blue bull, thereby meeting the requirements of the Italian trade.

****

Michael and Elizabeth have a young family and Michael also works for the local authority. Michael has made a huge contribution to the local community, especially concerning the Gaelic Athletic Association (GAA)

O'Dea's farm, Coiscéim

Name	Catríona O'Dea
Locality	Coiscéim, Carron, Co. Clare
Total agricultural land	202.3ha (500 acres)
Own land	202.3ha (500 acres)
Rented/leased land etc	0
Special Area of Conservation	202.3ha (500 acres)

Composition of land

Tillage	0
Pasture	2ha (5 acres)
Silage /Hay	4ha (10 acres)
Winterage	196.3ha (485 acres)

Agricultural production	Suckler herd (quota = 42)
Cattle	Mixed herd of mostly Hereford cross, Limousin cross, Aberdeen Angus cross 5 replacement heifers
Other animals	41 Suffolk sheep
Rural Environment Protection Scheme (REPS)	No

Additional information Most weanlings are sold after 6-9 months. Lambing takes place in April/May and lambs are sold in late summer/autumn.

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Catríona has been farming since she left school and now runs the family farm. She was county Secretary for the IFA for 4years One of a family of 6 girls and one boy, they have all been greatly involved in county sport (GAA), especially camogie.

Nagle's farm, Pollough

Name	Jim and Mary Nagle, Kilfenora
Locality of visit	Pollough, Carron, Co. Clare
Total agricultural land	101.2ha (250 acres)
Own land	101.2ha (250 acres)
Special Area of Conservation	48.6ha (120 acres) (Pollough, Carron)
Composition of land	
Tillage	0
Pasture	32.4ha (80 acres), mostly in Kilfenora, 8.1ha (20 acres) in Termon, Carron
Silage/hay	12.1ha (30 acres)
Winterage	48.6ha (120 acres)
Agricultural production	
Cattle	55-60 suckler cows Blonde Aquitaine, Limousin, Angus/ Hereford Calving c. 60 days in March, mostly in Carron; calves at 6-8 months from October on
Other animals	130 Suffolk/Charolais cross ewes (100 breeding ewes and 30 replacement dry hoggets) Lambing is c. 30 days in February; lambs sold from 11 weeks on
Rural Environment Protection Scheme (REPS)	Joined 1996 Supplementary measure: NHA/SAC

Additional information This farm has about half its land on deeper soils near Kilfenora, where the silage is cut. In Carron, the winterage is at Pollough and some green pasture is at Termon. Thirty-five cattle are on the winterage at Carron until April-May, the rest are on the lowland. About 40 ewes are placed on the green land at Termon, Carron, 2 months after weaning.

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Jim and Mary have five children, almost all grown. Jim is very involved in the local community, especially in the running of the Kilfenora Community Centre.

McCormack's farm, Glanquin

Name	Patrick and Cheryl McCormack
Locality	Glanquin, Kilnaboy, Co. Clare
Total agricultural land	91.1ha (225 acres)
Own land	91.1ha (225 acres)
Rented land	0
Grazing rights / commonage	0
Leased land	0
Special Area of Conservation	91.1ha (225 acres)
Composition of land	
Tillage	2.4ha (6 acres)
Pasture	23.1ha (157 acres)
Silage	4.9ha (12 acres)
Winterage	20.2ha (50 acres)
Agricultural production	Organic mixed farming
Cattle	20 cows (Limousin / Hereford cross)
Other animals	80 ewes (Texel / Suffolk cross) 6 horses 1 sow Bee hives
Rural Environment Protection Scheme (REPS)	Joined in 1995 Supplementary measure 6 - Organic farming

Additional information Some cattle are on the winterage from November 1st to May and some remain on the winterage during the rest of the year. Every second year, the tilled area is reseeded with grass.

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Patrick and Cheryl have a young family of five children. Partrick is originally from Kilfenora, and inherited the farm in the 1980s. He is a leading member of the Burren Action Group. Cheryl is originally from New York, and has a special interest in homoeopathy.

Kerin's farm, Bell Harbour

Name	Gerard and Sephine Kerin
Locality	Bell Harbour, Co. Clare
Total agricultural land	337.1ha (833 acres)
Own land	337.1ha (833 acres)
Special Area of Conservation	242.8ha (600 acres)
Composition of land	
Tillage	0
Pasture	60.7ha (150 acres)
Silage	33.6ha (83 acres)
Winterage	242.8ha (600 acres)
Agricultural production	180 Suckler cows and calves
Cattle	Charolais, Simmental, Aberdeen Angus, Hereford
Other animals	None
Rural Environment Protection Scheme (REPS)	No

Additional information 200 animals overwinter on the 600 acres of upland winterage. Calving takes place (February - April) in the open on the lowlands unless bad weather prevails during which time the animals are housed.

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Gerard and Sephine have a grown family and their son, Tomás, farms with them. Gerard specialises in pedigree breeding and is currently chair of the Co. Clare IFA. He has made a great contribution to the Gaelic Athletic Association (GAA).

O'Dea's farm, Bell Harbour

Name	John and Martha O'Dea
Locality	Bell Harbour, Co. Clare
Total agricultural land	40.5ha (100 acres)
Own land	40.4ha (100 acres)
Special Area of Conservation	2.8ha (7 acres)
Composition of land (acres)	
Tillage	0
Pasture	26.7ha (66 acres)
Silage	10.9ha (27acres)
Winterage	2.8ha (7 acres)
Agricultural production	Cattle & sheep
Cattle	40 Charolais cross suckler cows 6 one-and-a-half year heifers (Charolais cross, Limousin, Shorthorn)
Other animals	94 Suffolk cross ewes
Rural Environment Protection Scheme (REPS)	Joined in 1996 Supplementary measure: SAC/NHA not as yet
Additional information	5-6 cattle kept on winterage (during the winter). The remainder are kept indoors until April when the pasture can take them. Weanlings are sold at 1 year.

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John and Martha have two boys, Paul (20) and Enda (17). The farm is an intensive livestock farm. John is involved very much locally in the GAA.

The Burren National Park

The Burren National Park, managed by Dúchas - The Heritage Service, was established in 1991 as Ireland's fifth national park. It is situated on the south-eastern edge of the Burren, where the limestone hills fall away to lake-studded lowlands on glacial drift soils. The National Park has a present area of 1150 hectares and share ownership with private landowners of a substantial further area. The National Park incorporates all the main habitats typical of the wider Burren landscape of north County Clare: limestone pavement, hazel scrub, deciduous woodland, lakes, turloughs, springs, fen and calcareous grassland. The focal point of the National Park is Mullaghmore, a majestic mountain formed by the gentle folding of the Carboniferous limestone strata.

The reduction in population pressure on the land since the Great Famine of 1845-1849 has resulted in some areas of the National Park being re-invaded by hazel scrub and trees. However, traditional grazing practices are still maintained so that cattle graze the hills for the winter period and are removed before summer. This helps to maintain the rich flora by controlling the dominance of the more vigorous grasses. Domestic goats, which were once part of the traditional mixed farms, were progressively released onto the hills so that large herds of 'feral' goats now browse and graze throughout the National Park

Keelhilla National Nature Reserve

Keelhilla (Slieve Carron) National Nature Reserve is located in the north-east of the Burren region along the border between counties Clare and Galway. It comprises 145 ha within the uplands of the Burren and is entirely state-owned. The Reserve is dominated by a tall, east-facing escarpment with Eagle Rock on the cliff top, and woodland and scrub nestling on the scree slopes below. Other habitats are calcareous grassland, springs and deeply-fissured limestone pavement.

The area has a rich archaeological and historical context, relating to the legends of St. Colman MacDuagh, a hermit who lived in solitude at the base of the escarpment. Like the Burren National Park, traditional winter grazing continues within the Nature Reserve and feral goats roam through and within the area.

Appendix 2: List of delegates

Participants in the conference are listed below, together with their contact details in cases for which we have been able to obtain these. Included in italics are those who were unable to attend; in several cases this was due to severe transport difficulties caused by failure of UK air-traffic computers on the arrival day of the conference.

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European Forum on Nature Conservation and Pastoralism

The European Forum on Nature Conservation and Pastoralism brings together ecologists, nature conservationists, farmers and policy makers. This non-profit network exists to increase understanding of the high nature conservation and cultural value of certain farming systems and to inform work on their maintenance.

Europe's natural and cultural heritage is enriched by the wide variety of regional farming systems which work in harmony with local environmental conditions. However, many of these farming systems are currently under threat. The aims of the European Forum on Nature Conservation and Pastoralism are therefore:

- To increase understanding that certain European farming systems are of high nature conservation and cultural value.
- To ensure the availability, dissemination and exchange of supporting information combining research and practical expertise.
- To bring together ecologists, nature conservation managers, farmers and policy makers to consider problems faced by these systems and potential solutions.
- To develop and promote policy options which ensure the ecological maintenance and development of these farming systems and cultural landscapes.

To achieve its aims, the Forum holds conferences every two years, organises workshops and seminars and produces two issues of the newsletter *La Cañada* per year. It also conducts research into the ecological relationships on high nature conservation value farmland and into the development of appropriate policies for such areas.

The seventh meeting of the Forum was organised by the European Forum on Nature Conservation and Pastoralism with the Heritage Council of Ireland.

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