

The role of Romanian pastoralists in conserving agricultural biodiversity

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Abstract

Agri-environment measures and nature conservation programmes are being developed in Romania with the objective of conserving semi-natural grassland habitats and their associated species. This interdisciplinary research combines ecology with social anthropology and uses a case study of a Romanian mountain village to investigate the role of pastoralists in conserving agricultural biodiversity. The aim of the ecological element of this research is to analyse the relationship between land management practices and the butterfly fauna of hay meadows. The ecological component of this research is contextualised within an examination of the organisation and functioning of pastoralism in the village and within an identification of the factors that both sustain and constrain the continuation of this small-scale and semi-subsistent form of livestock production.

The results indicate that the current spectrum of hay meadow management intensities conserve a high diversity of butterfly species. Ordination of the butterfly data revealed the significance of the timing of the hay cut and the importance of late mown meadows, recently abandoned meadows and unmanaged rocky calcareous grasslands in providing habitat for species in the second half of the summer. The number of autochthonous butterfly species is significantly negatively correlated with an increase in management intensity. Intensification in hay meadow management beyond current levels would lead to a comparatively depauperate butterfly fauna. However, the cessation of hay production in the village (which in the long term also causes a decline in the number of butterfly species) is a more probable scenario as the land has limited potential to be used for more intensive modes of agricultural production.

It is still a necessity for the majority of households in the village to maintain a smallholding to produce food for their own table. This necessity will lessen as Romania's economy develops. The functioning of the livestock production system in the village is already showing signs of being threatened by the rejection of shepherding as a

livelihood as men leave the profession for new employment opportunities that provide better working conditions. The proposed agri-environment measure that will target the conservation of semi-natural grasslands will be insufficient to support the viability of shepherding livelihoods or to maintain the economic rationale for smallholding based production. The conservation of Romania's semi-natural grasslands depends on the continuation of pastoralism and means must be sought to make pastoral livelihoods a viable and attractive option.

Declaration

I hereby declare that this thesis is my own composition, that the work described is my own except where assistance is explicitly acknowledged, and that it has not been submitted for any other degree or professional qualification.

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Acronyms

EU	European Union
EC	European Commission
CAP	Common Agricultural Policy
RDP	Rural Development Programme
AEM (AEMs)	Agri-environment measure (s)
HNV	High Nature Value
LEADER	Liason Entre Actions pour le Développement de L'Economie Rurale (Links between Actions for the Development of the Rural Economy)
LFA	Less Favoured Area
PEBLDS	Pan European Biological and Landscape Diversity Strategy
CBD	Convention on Biological Diversity
EEA	European Environment Agency
RMARD	Romanian Ministry of Agriculture and Rural Development
DCA	Detrended Correspondence Analysis

Introduction

Section 1. Research objective and thesis structure

Research objective

The importance of the role of pastoralism in conserving semi-natural grasslands in Europe is now well documented (Bignal and McCracken, 1992; Beaufoy et al, 1994; Bignal and McCracken, 1996; Tubbs, 1997; Bignal and McCracken, 2000). A growing body of ecological literature generated in European Union (EU) countries and Switzerland evidences the difficulty in conserving these habitats and their associated species once low-intensity pastoral land management practices are abandoned or intensified (Ostermann, 1998; Fischer and Wipf, 2002; Poschlod and Wallies de Vries, 2002; Wahlman and Milberg, 2002; Stefanescu et al, 2005; Wenzel et al, 2005; Öckinger et al, 2006).

In Romania, pastoralism is still prevalent in the mountain regions where significant areas of pastures and hay meadows continue to be managed at a low intensity. However, the widespread persistence of pastoralism in Romania's mountains is an indication of the strong economic rationale for rural households to practice semi-subsistent livestock production. As the economy of Romania develops it is inevitable that the need for rural households to maintain labour intensive smallholdings will lessen and that more commercial and intensive forms of livestock production will increase.

The accession of Romania to the EU in January 2007 has resulted in the preparation of a national Rural Development Programme (RDP) for the period 2007-2013. This includes an Axis 2 agri-environment measure (AEM) that aims to maintain high nature value (HNV) grasslands. The short timetable for the development and implementation of the RDP has meant that the HNV grassland AEM has been designed in the absence of a clear evidence base of information detailing the ecological relationships between low-intensity farming practices and semi-natural grasslands.

This interdisciplinary research has combined ecology and ethnography to examine the role of pastoralism in a Romanian mountain village in conserving high nature value semi-natural grasslands. The research tests the assumption that the current intensity of meadow management practices is compatible with the conservation of butterfly species. Butterflies were chosen as the focus of this research because they are sensitive indicators of the state of semi-natural grasslands. Butterfly transects were used as the basis for collecting both butterfly (species and number of individuals) and vegetation height data. Semi-structured interviews were conducted, where possible, with the owners of the meadows through which these transects passed. The collection of meadow management data, using semi-structured interviews and participant observation, allowed an interpretation of how meadow management is influencing the spatial and temporal distributions of butterfly species.

This ecological element of the research is contextualised within an analysis of the organisation and functioning of the pastoral production system in the village. This element of the work, drawing upon data collected by participant observation and semi-structured interviews, enabled the identification of certain specific obstacles to the implementation of the rural development measures that will target the conservation of semi-natural grasslands.

Thesis structure

The second section of this introductory chapter describes the importance of pastoralism for biodiversity conservation in Europe and the policy measures that have been developed to support the land management practices that conserve semi-natural grasslands and their associated species. The introduction is followed by two draft papers:

Paper 1: The influence of traditional hay production practices on the butterfly fauna of subalpine meadows in Romania,

Paper 2: Smallholding based pastoralism in the Romanian Carpathians: implications for agri-environment programmes directed at the conservation of semi-natural grasslands.

These papers intersect at the level of the hay meadow. The first paper demonstrates the importance of low-intensity hay production for the conservation of butterfly species. The paper emphasises the point that the heterogeneity introduced into the landscape by the subtle variations in hay meadow management (caused by a combination of human, topographic and edaphic factors) cannot be replicated by conservation management at an equivalent spatial scale. It is therefore imperative to find solutions to making pastoralism a socially and economically viable livelihood option

The second paper evaluates the practicability of the high nature value (HNV) grassland agri-environment measure (AEM) land management prescriptions from the (externally assessed) perspective of hay meadow owners and professional shepherds. Whilst this AEM alone will be unable to sustain pastoral production systems, it may at least offer some financial assistance to pastoralists. The AEM is voluntary and an evaluation of the practicability of the management prescriptions is necessary to ensure that these will not prove off-putting to potential scheme applicants. Fieldwork was completed in 2006 before the implementation of the high nature value grassland AEM and for this reason, the direct experience of scheme applicants could not be examined. Note that this paper was written before the final version of the AEM was released following the publication of the Romanian Rural Development Plan in February 2008 (see RMARD, 2008).

The discussion expands on the conclusions made and points discussed in both of these two papers. The conclusion reemphasises the point that the conservation of semi-natural grassland habitats and their associated species is dependent upon the continuation of pastoralism that is both economically and socially sustainable.

Section 2. Background to the research

Semi-natural grasslands in the Romanian mountains

Pastoral land management practices maintain significant areas of semi-natural grasslands in Romania and these habitats harbour high numbers of plant and invertebrate species. The national extent of pastoral habitats has been estimated to be 2.6 million hectares (Sârbu et al, 2004) and a significant proportion of this area is likely to occur in the mountain regions. Here low-intensity forms of livestock production persisted throughout the 20th century and continue to remain widespread. Pastoralism in the Romanian mountains is typified by the semi-subsistent production of livestock on smallholdings (81.3% of all holdings in Romania consume more than 50% of their own production (8: RMARD, March 2007)) and less commonly, more commercially orientated holdings that produce for the market but which still use low-intensity land use practices. Over 800 000 households in the mountain areas, 85% of all households in these regions, own agricultural land (14: RMARD, March 2007). Data from 1985 records that, at this time, mountain holdings comprised, on average, 2.4 hectares of land, 1 to 2 cows and 3 sheep (Rey, 1985). Nationally, the average area of an agricultural holding in individual ownership in 2007 amounted to 2.2 ha (8: RMARD, March 2007) and it is probable that this is also reflective of the current size of most mountain holdings.

In the mountains, a considerable proportion if not all of the smallholding land is dedicated to the production of hay for winter fodder. Livestock are communally pastured during the summer months on commons or privately owned pastures. Data from 1980 records the existence of 1.2 million hectares of pasture and 0.8 million hectares of meadow in upland regions (defined as above 500m in altitude) (Pauca-Comanescu and Marusca, 1999). The current extent of semi-natural pastures and meadows in the Romanian mountains is yet to be ascertained but it is safe to assume that they have since reduced in area. Pauca-Comanescu and Marusca (ibid) report that the ratio of forest to grasslands in the mountains has increased as a result of the abandonment of land-use

during the 1990s. There is no detailed information on the rate or extent of land abandonment in Romania but the trend is highlighted as a threat to the conservation of semi-natural habitats in mountain regions (Baur et al, 2006; Schmitt and Rákósy, 2007; 16: RMARD, March 2007). It is also anticipated that semi-natural grasslands in the uplands, particularly on more gentle slopes, will be impacted by the economic development of farming systems and the subsequent intensification of land use practices, a trend that has to date mainly been limited to the lowlands of Romania (Sârbu et al, 2004; Schmitt and Rákósy, 2007).

The development of semi-natural grasslands in Europe

A narrative of the decline of semi-natural grasslands in Europe should acknowledge that their creation over several millennia has entailed the clearance of more natural woodland habitats. Until recently, visions of the primeval lowlands of Europe predominantly adhered to the view that the landscape was once dominated by closed forest in which there were small clearings caused by fire, wind throw or the death of old trees for example (14: Ellenberg, 1998). Large herbivores (elk, aurochs, bison, red deer, roe deer, tarpan and wild boar) would have been dependent upon these clearings, maintaining their openness once established.

This paradigm has been challenged by Vera (2000) who has proposed an alternative hypothesis that suggests that grazing by large herbivores would have maintained open landscapes, more akin to parkland or wood pastures. These open landscapes would have been comprised of a mosaic of grasslands, scrub, solitary trees and woodland groves. Vera bases this theory on the occurrence of oak and hazel, two shade intolerant tree species, in the pollen record.

Vera's hypothesis has since been challenged by further analyses of the pollen record leading Svenning (2002) to conclude that whilst large herbivores are likely to have

played a role in creating open vegetation, closed forest would have predominated. Areas likely to contain naturally open habitats would have been limited to floodplains, uplands (with either calcareous or infertile sandy soils) and forest steppe or open oak forest in the warmer continental or sub-Mediterranean regions. Svenning's proposition is corroborated by Mitchell (2004) who finds a similar occurrence of oak and hazel in the pollen record data from Ireland where only red deer and wild boar have existed since the last glacial period with data collected from regions where large herbivores were present. He concludes that factors other than grazing are more likely to have sustained oak and hazel in the primeval landscape. If the conclusions of Svenning and Mitchell are correct, natural grassland communities have always been limited in extent in much of Europe.

However, the influence of humans in creating open landscapes and semi-natural grasslands during the latter half of the Holocene is indisputable. Pastoralism is believed to have spread into Europe from the Middle East, reaching Turkey 8500 years ago and the United Kingdom 6000 years ago (Mason, 1984). Neolithic agriculture probably entailed the irregular use of grasslands as pastures. The mowing of grasslands for fodder may have occurred in north west Europe as early as the Iron Age (Hodgson et al, 1999) but was certainly occurring during the Roman Empire with the majority of meadows in central Europe being established during the Middle Ages (Poschlod and Wallies de Vries, 2002).

Semi-natural calcareous grasslands are particularly species rich in plants, butterflies and grasshoppers and for this reason receive considerable attention from ecologists (Dolek and Geyer, 2002; Fischer and Wipf, 2002; Poschlod and Wallies de Vries, 2002; Steffan-Dewenter and Tschardtke, 2002; van Swaay, 2002; Wallies de Vries et al, 2002; Willerding and Poschlod, 2002; Wenzel et al, 2006). Poschlod and Wallies de Vries, (2002) illustrate, however, how far they are from being 'natural' habitats. In central Europe, natural calcareous grasslands are likely to have been extremely limited in their extent, occurring on outcrops, hilly domes with shallow soils, steep slopes and gravel banks in the foothills of the Alps (ibid). Although the development of semi-natural

calcareous grassland has occurred at various stages since the Neolithic period, palynological analyses suggest that the first major expansion of the habitat occurred during the Roman Empire (ibid). Various land use practices other than grazing and mowing have also played an important role in creating semi-natural calcareous grasslands including the three-field-rotation system in use since the 15th century, the transhumance of sheep flocks between the 15th and 18th centuries and the sowing of hay seed and of specific species as arable fodder crops (ibid). The creation, expansion and demise of these habitats reflect the development and wane of specific land use practices in response to changing socio-economic environments.

Population growth is likely to have been a key determinant of the expansion of settlements and semi-natural grasslands into mountain regions in Europe. In Switzerland, the Romanic people moved into higher areas from 1800 BC maintaining permanent villages at lower altitudes and seasonally occupied settlements at higher altitudes (Maurer et al, 2006). The north eastern Alps were settled from 600 AD by Alemannic immigrants from the north whilst the higher areas of the eastern Alps were settled by the Walser Alemannic people from the Vallais (ibid).

The ability to establish the history of the settlement of the Romanian Carpathians, and hence the origins and development of pastures and meadows in this region, is clouded by the 'Transylvanian Question'. Hungarian nationalists have claimed that Transylvania was uninhabited when Hungarians arrived in the region in the 11th century. They maintain that the Romanians only entered the area in any considerable numbers from the Balkans in the 12th and 13th centuries (Hupchick and Cox, 2001). This has been disputed with the counter claim that, following the demise of the Roman presence in the country, Romanians fled to the mountains to escape the successive waves of Germanic and Asiatic migrations that occurred between the 3rd and 9th centuries and only descended to the lowlands in the 11th century, at which point they were conquered by the Hungarians.

Ethnographic investigations have indicated that the similarity in the organisation and terminology of pastoralism throughout the Carpathian Mountain chain corroborates the hypothesis that pastoralists migrated through the mountains from the south east to the north west during the later part of the Middle Ages (Podolak, 1989). The first documentary evidence of pastoralism in the Romanian Carpathians dates from the 13th century and relates to deeds for hay meadows and pastures (Idu, 1999). Semi-natural grasslands in some areas of the Romanian Carpathians may therefore be at least 800 years old. These examples illustrate how open habitats have come to dominate European landscapes and why a significant part of the continent's biodiversity is now dependent upon the continued use of pastures and meadows by pastoralists.

The high nature value of pastoral land use practices

The intensive management of grasslands decreases plant species diversity and acts to homogenise vegetation structure. In some instances, grasslands are managed to favour a few faster growing species for the purpose of maximising productivity and economic returns (Beaufoy et al, 1994). Pastures, for example, may be reseeded or 'improved' with *Lolium perenne* (perennial ryegrass) and *Trifolium repens* (white clover) and encouraged to grow faster through high inputs of slurry or chemical fertilisers. These species may also come to dominate the vegetation community of a pasture without reseeded as they are able to withstand high intensities of disturbance through trampling and grazing. In general, the higher the intensity that a pasture is used, the poorer in species it becomes (599: Ellenberg, 1988). The productivity of grasslands is high and species richness is low when environmental stress (e.g. drought or nutrient scarcity) or disturbance (e.g. grazing, mowing, trampling or burning) is low as competitive species are able to dominate (Grime, 1973). Species richness increases at intermediate levels of stress or disturbance and declines again at high levels of both as few species are able to tolerate these conditions (ibid).

These principles also apply to the vegetation of meadows. Species that are unable to use higher nitrogen levels are out-competed by those that can when the level of fertilisation increases. Increased growth rates then permit more frequent mowing, further disadvantaging species that are unable to complete life cycles in a shorter period or regenerate after the first cut (Zechmeister et al, 2003). More intensive modes of production essentially overcome the natural limits of the environment through high inputs of agro-chemicals, fuel, mechanisation and, in livestock systems, the use of breeds of animal that require high inputs of intensively produced fodder or concentrates but which produce high yields of meat or milk.

In contrast, low-intensity agricultural management practices are typically adapted to and remain constrained by the natural environment and are characterised by low nutrient inputs per hectare and low outputs of products per hectare (Bignal and McCracken, 1996). Low-intensity production systems now predominantly occur in Europe in areas where the constraints of the natural environment cannot be overcome by high levels of inputs. Pastoralism can be defined as the low-intensity production of livestock and, in Europe, can be characterised by the substantial reliance on semi-natural grasslands (Scottish Agricultural College, 2003).

The action of mowing and grazing prevents the re-establishment of trees and shrubs on pastures and meadows that were once created by the clearance of woodland. These management practices favour species with life cycles that can withstand this level of disturbance but without which, would be out-competed by species that would otherwise dominate (553: Ellenberg, 1988). In a single meadow, the number of plant species will be higher if it is managed for fodder rather than litter (where vegetation is mown for bedding). However once mown fodder meadows contain more species than they would otherwise do if mown twice (556: Ellenberg, 1988). This corroborates the intermediate disturbance hypothesis whereby species richness is low at low levels of disturbance as this favours a small pool of more competitive species and is also low at high levels of disturbance when only ruderal species, plants adapted to colonising highly disturbed areas, can thrive (487: Crawley, 1997). Accordingly, plant species diversity in pastures

is highest when they are lightly grazed but, in contrast to mowing, grazing is more selective in the removal of certain species (554: Ellenberg, 1988).

Small-scale variation in vegetation composition in pastures may also be caused by the deposition of dung (Dai, 2000) and by trampling and the creation of tracks (603: Ellenberg, 1988). The past management of grassland will also affect the current species composition of the vegetation (Gustavsson et al, 2007). The influence of past and present management practices in combination with edaphic and climatic factors therefore has a significant influence on the species composition of semi-natural grasslands (556: Ellenberg, 1988).

Many invertebrate life-cycles are intimately linked with specific plant species. As phytophagous invertebrates, butterflies illustrate this relationship well: their larvae feed on plants. The larval host plants of most UK species of this taxon are associated with semi-natural grasslands (338: Asher et al, 2001). Butterflies can therefore act as sensitive indicators of changes in semi-natural grasslands (Erhardt, 1985). Declines in butterfly species occur following the intensification of land management practices and, conversely, when management ceases. In the short-term the abandonment of meadows and pastures may lead to an increase in the diversity of semi-natural grassland species in the absence of the disturbance introduced into the habitat by mowing and grazing. In the past, management has been halted on nature reserves based on the recognition that the diversity of species can increase on recently abandoned sites (Dolek and Geyer, 2002). However, a lack of management in the long-term will lead to the eventual return of forest and the loss of taxa associated with open habitats (Erhardt, 1985; Balmer and Erhardt, 2000; Baur et al, 2006; Schmitt and Rákósy, 2007). Abandonment threatens 29 of the 37 butterfly species in Europe that are most associated with calcareous grasslands (van Swaay, 2002). In southern Sweden, 86% of the sites occupied by the woodland brown (*Lopinga achine*) are unmanaged. Unless mowing and grazing is re-introduced, it is predicted that the metapopulations of this species will collapse in 20-40 years (Bergman, 2001).

The conservation management of semi-natural grasslands often focuses on a single taxon or species (Wallies de Vries et al, 2002) and general management prescriptions are unlikely to meet the ecological requirements of the full range of species associated with a site (Wettstein and Schmid, 1999). Ecologists suggest that conservationists should aim to introduce spatial heterogeneity into the management of sites to overcome the favouring of a narrow range of species (Wettstein and Schmid, 1999; Wallies de Vries et al, 2002). Sustaining the species of semi-natural grasslands through conservation management following the cessation of pastoral land management practices is therefore very difficult to achieve and requires considerable financial resources (Poschlod and Wallies de Vries, 2002).

The difficulty of balancing the management needs of different species increases when semi-natural grasslands become fragmented, reduced in size and isolated in a matrix of more intensively used farmland or regenerating forest. In this instance, the ecological processes that sustain semi-natural grassland species can be disrupted. For example, many species exist in metapopulations, spatially distinct populations from which individuals can disperse and recolonise locations where extinctions have occurred. If dispersal is hindered by unsuitable matrix habitat or if the number of spatially discrete local populations dwindles, the chances of the recolonisation of the site once suitable habitat conditions return is reduced (Wallies de Vries et al, 2002). The conservation management of remnants of semi-natural grasslands is therefore, at best, a poor substitute for the low-intensity production of livestock.

The decline of semi-natural grasslands in Europe

Semi-natural grasslands have been created and maintained for the purpose of raising livestock. It is inevitable that pastures and meadows will decline in extent once the need to continue with low-intensity livestock production practices is removed. Three common

causes of the decline in semi-natural grasslands include: the intensification of grassland use, the conversion of grasslands to alternative forms of production e.g. arable or forestry or the complete abandonment of livelihoods based on livestock production.

The technological and economic development of agriculture, particularly in the latter half of the 20th century, has greatly reduced the reliance of livestock production on semi-natural grasslands in the lowlands. Most unmanured semi-natural grassland sites occurring on average soils in the lowlands of central Europe have been converted to arable or forestry use (556: Ellenberg, 1988). Over 50% of permanent grasslands were lost in north east France between 1970 and 1985 (Beaufoy et al, 1994). The loss of semi-natural grasslands through agricultural 'improvements' is suggested to have been the most important factor that has caused the decline of British butterflies (Asher et al, 2001). In the lowlands of Britain, semi-natural grasslands now only account for less than 2% of the total area of permanent grasslands (ibid).

Declines in the biodiversity of semi-natural grasslands in the uplands of Europe are also evident. Stefanescu et al (2005) report that hay meadows, traditionally flooded in the winter months, are the most important habitat in the Aiguamolls de l'Empordà Natural Park in Catalonia for both plant and butterfly species. Conversion to the production of arable crops and fodder crops other than hay decreased the area of meadows by nearly 80% between 1956 and 2002 (ibid). Complete abandonment of mowing and grazing can also lead to dramatic declines in the area of semi-natural grasslands. In the province of South Karelia in south eastern Finland, the area of semi-natural grasslands has declined to 0.4% of the extent that they covered in the early part of the 1900s (Marttila et al, 1999).

During the period 1970 to 1988 in the EU, energy use by the agricultural sector increased by 46% reflecting a 45% increase in the use of farm machinery and a 30% decrease in labour (Potter, 1997). By the middle of the 1980s, 20% of farms (the largest in size and most industrial) were producing 80% of all outputs in the EU (ibid) and were

receiving 80% of all EU agricultural production subsidies. In other words, the 80% of smaller farms were receiving a meagre 20% of the Common Agricultural Policy's (CAP) budget. This direction of support towards farms on more productive land acted to further marginalise less-intensive forms of production on inherently unproductive terrain (Beaufoy et al, 1994).

However, it is also important to emphasise that pastoralism may have been practised in many regions for the purpose of providing a safety-net for pluriactive livelihoods in the absence of stable opportunities for the generation of off-farm income (see Netting, 1981 and Viazzo, 1989). Once more financially rewarding and less physically arduous employment opportunities are created the need to continue with semi-subsistent livestock production is reduced. In the Alps for example, the number of people engaged in pastoral activities greatly decreased in the last century (ibid). Commercial forms of livestock production remain important in the region but there has been a trend towards the intensification of land use on more productive terrain and the abandonment of steeper, higher and more remote semi-natural grasslands which require higher inputs of labour for lower economic returns (Zechmeister 2002; Maurer, 2006; Kampmann, 2007). The area of *Mähder* meadows, species rich high meadows traditionally mown every other year to make up for short falls in hay production on lower slopes, declined in the region of Davos in Switzerland by 70% between 1945 and 1984 (Fischer and Wipf, 2002).

It is therefore important to understand the range of factors that cause the demise of pastoralism and the concomitant reduction in the extent of semi-natural grasslands. From this basis, measures can be developed that will effectively support the low intensity production of livestock, whether as part of a pluriactive livelihood or as a full-time occupation.

The conservation of semi-natural grasslands in Europe

The decline in biodiversity associated with agricultural land has, since 1993, resulted in the implementation of agri-environment measures (AEMs) in EU Member States under regulation 2078/92 (Beaufoy et al, 1994) and in Switzerland (Kampmann et al, 2007). However, the funds available for the EU AEMs represent a very small proportion of the overall total expenditure of the CAP and amounted to only 4% in 1999 (Wilson and Hart, 2001). Despite the comparatively low level of funding, the total area of farmland entered into AEMs has reached over 20% (or 900 000 holdings) of the total utilisable agricultural area in the 25 Member States (Siebert et al, 2006). However, it has been argued that the conservation of biodiversity on farmland could be better achieved by switching the focus of AEM support away from the de-intensification of farmland and towards the support of the low-intensity and *high nature value* (HNV) farmland that is still in existence (Beaufoy et al, 1994; Bignal and McCracken, 1996; Bignal and McCracken, 2000). Evidence based advocacy has been successful in gaining the inclusion of HNV farming systems into the 'improving the environment and the countryside' component of the EU Rural Development Programme (RDP) for the 2007-2013 period (2006/144/EC).

Although not clarified in the European Commission's (EC) strategic guidelines for rural development, HNV farmland has been defined as:

'those areas in Europe where agriculture is a major (usually the dominant) land use and where that agriculture supports or is associated with either a high species and habitat diversity or the presence of species of European conservation concern or both' (Anderson, 2003)

The concept of HNV farmland is not yet well understood by the range of stakeholders involved in the conservation of biodiversity on farmland (Larkham, 2007). Nevertheless, it has thus far proven to be a useful tool in directing attention towards farming systems that play a critical role in conserving biodiversity both within the Natura 2000 network

(sites protected by legislation under the Habitat Directive (92/43/EEC) for the purposes of biodiversity conservation) and in the wider 'unprotected' countryside of Europe. Further impetus for the inclusion of HNV farming systems in the 2007-2013 RDP has come from the Pan-European Biological and Landscape Diversity Strategy (PEBLDS), an initiative of the Council of Europe adopted in 1995 (Ostermann, 1998). This is one of the main mechanisms in Europe for achieving the goals of the Convention on Biological Diversity (CBD). Signatories to the convention have committed to reducing losses of biodiversity by 2010 and from a European perspective this will therefore entail the conservation of farmland habitats. Accordingly, at the fifth Environment for Europe Conference held in Kiev in 2003, European environment ministers committed themselves to supporting, using agri-environment and rural development measures, the ecological and economic viability of a substantial proportion of high nature value farmland by 2008 (EEA, 2004).

As the Kiev commitment indicates, a range of rural development measures will need to be employed to support HNV farming systems. The Less Favoured Area (LFA) measure has arguably played a more important role than AEMs in supporting the economic viability of low-intensity pastoral farming systems given the limited financial resources made available for the latter and the concentration of pastoralism on land that has limited capacity to be farmed using intensive methods (Beaufoy, 1994). Nevertheless, it is still critically important to ensure that AEMs directed at the conservation of semi-natural grasslands are as effective as possible, and given their voluntary nature, are as attractive to farmers as possible.

Financial advantage is the main reason why farmers enter into voluntary agri-environment schemes (Wilson and Hart, 2001; Siebert et al, 2006). Conversely, economic factors will also cause non-participation if the financial support that AEMs offer is unable to compete with the income that could be gained through alternative land uses and livelihoods. The market policy or 'first pillar' of the CAP now operates in a more liberalised trade environment and the quest for economic competitiveness has

become paramount. Increasing the size of holdings continues to remain one of the main means of achieving this. Accordingly, 'improving the competitiveness of the agricultural and forestry sector' is the first of the three core policy objectives of the 'second pillar' of the CAP, the Rural Development Programme (RDP).

The RDP is divided into three main axes: axis 1 measures contribute towards 'improving the competitiveness of the agricultural and forestry sector', axis 2 measures are directed towards 'improving the environment and countryside' and axis 3 measures will seek to improve 'the quality of life in rural areas and encouraging diversification of the rural economy' (2006/144/EC). The fourth crosscutting axis (known as LEADER) aims to contribute to these first three axes in the 'horizontal priority of improving governance and mobilising the endogenous development potential of rural areas' (ibid). It remains to be seen whether axis 1, 3 and 4 measures can be combined with axis 2 measures (including both the LFA measure and AEMs) to ensure that HNV farming systems can become socially and economically viable in the period 2007 to 2013.

The community strategic guidelines for rural development for the period 2007-2013 'should reflect the multifunctional role farming plays in the richness and diversity of landscapes, food products and cultural and natural heritage throughout the Community'. Multifunctionality became a buzzword in rural development in Europe during the 1990s in an attempt to 'legitimise public aid to agriculture' in relation to non-market 'side effects' (Glebe, 2004; Dufour et al, 2007). The Agenda 2000 reform of the CAP, instigated in the late 1990s (setting out the financial priorities of the CAP for 2000 to 2006) aimed to give coherence to agricultural restructuring, territorial and local development and environmental objectives by the formation of the second rural development pillar of the CAP.

During the process of the formation of the Agenda 2000 proposals the Council of the European Commission developed a set of conclusions that formed the basis of the concept of the European Model of Agriculture (document 12509/97). This model sets

out the principles underpinning a multifunctional role for agriculture. In addition to the core aim of being 'modern and competitive', the farming sector should use 'environmentally friendly production methods' and 'serves rural communities, reflecting their rich tradition and diversity, and whose role is not only to produce food but also to guarantee the survival of the countryside as a place to live and work, and as an environment in itself'. The multifunctional role of agriculture is therefore seen as providing 'goods' or 'services', above and beyond the production of food, that benefit wider European society (Knickel and Renting, 2000).

This policy rhetoric might seem to favour the direction of support towards the pastoral production systems that produce food using environmentally sustainable practices and which maintain natural and cultural heritage. However, the text of the strategic guidelines of the 2007-2013 RDP refers back to the conclusions of the EC Council meeting in Göteborg in June 2001: 'strong economic performance must go hand in hand with the sustainable use of natural resources and levels of waste, maintaining biodiversity'. It is unclear where this leaves production systems that will always be marginal economically yet which are often the most able to deliver a suite of non-production goods to society.

Conservation of semi-natural grasslands in Romania: research priorities

In Romania, 71% of all holdings are categorised as subsistence farms by Eurostat (8: RMARD, March 2007). For this reason it is imperative that rural development measures directed at the support of HNV farming systems do not perpetuate rural poverty and low standards of living (Bignal and McCracken, 1996). It is probable that many rural households would opt to cease semi-subsistent production if they had the choice. However, where AEM and LFA payments can contribute to making HNV production systems socially and economically viable, it is important that they are based on sound ecological principles and are practicable to implement.

McCracken and Bignal (1998) suggest that 'simply having a broad appreciation of which farming systems are good for certain species or species assemblages is of little use without a detailed understanding of how each particular farming system functions'. They use a case study of the ecology of the chough, *Pyrhacorax pyrrhacorax*, on farmland on the Hebridean island of Islay to illustrate the complexity of the relationship between this species and farm management practices. The study primarily investigated the feeding requirements of chough during the breeding season but identified a range of farm management factors that in combination with environmental conditions, will determine the suitability of habitat for this species. Fieldwork indicated that during the breeding season the chough were selectively feeding in grasslands where management in the previous late summer/early autumn had created medium to high grass swards that were subsequently reduced in height by grazing during the winter and spring. They attributed this pattern to the suitability of high swards in late summer and autumn for encouraging the presence of crane flies (Diptera: Tipulidae) resulting in the high numbers of larvae of this species (known as leatherjackets) in the soil during late winter and early spring. Choughs could access the larvae in the soil, at this time, in fields where the sward height had been reduced.

Bignal and McCracken emphasise that these findings shed light on just one element of the relationship between the chough and farm management practices within the context of the specific climatic factors of the breeding season investigated. The species utilises a range of feeding habitats and strategies at different times of the year and these will be influenced both by current and past land management practices in combination with the environmental characteristics of sites and climatic factors. Nonetheless, they have demonstrated the importance of investigating the ecological relationships between land management practices and the species and habitats of concern.

Understanding the functioning of HNV farming systems will be similarly critical in developing effective biodiversity conservation measures in Romania. Here the speed of

the policy development process has surpassed the collation of data that evidences which land management practices can be described as being of high nature value. As a consequence, policy makers have little information detailing which agricultural systems are critically important in conserving biodiversity and why this is.

This research adopts the approach pioneered by McCracken and Bignal (1998) to explain the ecological importance of land management practices for butterflies within the context of the functioning of the farming system. The contextual level of analysis not only helps to piece together the ecological jigsaw but allows an identification of the practicability of the proposed management requirements for those that will voluntarily enter into AEM agreements. Such an interdisciplinary approach, combining ecology and ethnography, is particularly important in Romania where HNV pastoralism is often practised because it is still a necessity for the majority of rural households to produce food for their own table.

This research uses a case study of a Romanian mountain village to illustrate the ecological relationships between the land-management practices of smallholders and the assemblages of butterflies occurring in hay meadows. This ecological element of the work is contextualised within an understanding of the functioning of the pastoral production system.

Section 3. Case study location and description

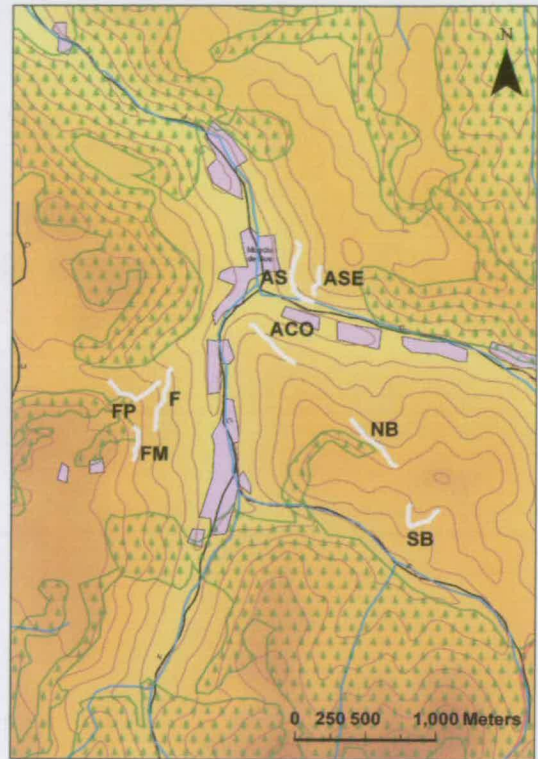
Natural environment

Moeciu de Sus (25° 19' 46.89"E, 45° 26' 41.83"N) is one of several villages that lie along the Bran-Rucăr corridor, a pass through the Carpathian Mountains that connects Transylvania in the north with Wallachia in the south. Flanking the west of the corridor, which is aligned along a north east to south west direction, is the Piatra Craiului massif and to the east are the Bucegi Mountains. Moeciu de Sus lies at the base of the Bucegi Mountains and belongs to the Moeciu *comună* (parish) which also includes the villages of Moeciu de Jos (Lower Moeciu), Cheia, Drumul Carului, Peștera and Măgura. The total area of the *comună* amounts to 10 943 ha of which 4111 ha are classified as agricultural land (69% of the agricultural land is pasture and 26% meadow). The centre of the village is at a height of just under 1000m and the haymeadows on the surrounding hillslopes rise up to approximately 1300m. The majority of the soils in the wider Moeciu area are acid brown soils formed from crystalline schist parent material and rendzinas forming on chalk conglomerates.

Figure 1. Location of study area. Moeciu de Sus is located in the county of Braşov, in the foothills of the Bucegi Mountains. The map on the right hand side illustrates the locations of the eight butterfly transects (see the first paper in this thesis for a description of the transects).



Cartographers: Philippe Rekacewicz,
Emmanuelle Bournay, UNEP/GRID-Arendal
http://maps.grida.no/go/graphic/romania_topographic_map (last accessed autumn 2008)



ESRI and Romanian National Agency for
Cadastre and Land Registration

Meteorological data collected at the Fundata weather station, a neighbouring village to Moeciu de Sus, is available for the years of this research (2004-2006) but at a cost far beyond the capacity of the budget. The characteristics of the local climate in Moeciu de Sus are therefore summarised from previous studies to provide a general context. The climate of Romania is continental in character with marked differences between the temperature of the winter and summer months. In the Carpathian Mountains the mean annual temperature at an altitude of 1000-1200 m is 5°C, and decreases by 0.5°C with every 100 m rise in altitude (Pauca-Marusca and Comanescu, 1999). This figure is

corroborated by data recorded at the weather station sited at 1371m in Fundata. In Fundata, the mean average temperature for the period 1981-1990 was 3.78°C and suggests that in this period, the mean annual temperature in Moeciu de Sus would have been approximately 5°C (Dumitru, 2003). The lowest temperature in the data set for this period, -23°C, was recorded in March 1987 and the warmest, 28.7°C in July 1980 (ibid). For the period 1981-1990, the mean annual level of precipitation recorded at the Fundata weather station was 792.6 mm. At 738.7 mm per year, the level of precipitation in Moeciu de Sus is less than that of a village situated 200 m lower in the valley (Moeciu de Jos – 784.3 mm) and is contrary to the normal trend of precipitation increasing with altitude. This is explained as being a consequence of the sheltered location of Moeciu de Sus in a depression in the foothills of the mountains. The highest monthly averages of precipitation occur in the summer months. The predominant direction of the wind recorded at the Fundata weather station is NE-SW. Snow cover can last from between October and April with an average of 10.3 days recorded in March and 9.7 recorded in September in Fundata during the period 1981-1990.

Prior to their clearance, the hill slopes rising up from the valley floor would have been forested with a mixture of *Abies alba* (European silver fir) and *Fagus sylvatica* (beech) with some *Picea abies* (Norway spruce) with *Fagus sylvatica* occurring more frequently on the warmer south west facing slopes and more *Abies alba* on the cooler damper west facing slopes (Tok, 1998). Although there are small areas in the vicinity of the village that are used for pasturing animals during the summer months, the vast majority of the cleared slopes in the immediate surroundings of the village, in the region of 700 ha, are dedicated to the production of hay. A study of the hay meadows of the village and the neighbouring village of Fundata in 1998 using the Braun-Blanquet method of describing vegetation identified 11 different plant communities. Two of these communities are located in damp areas (*Caricion davallianae* and *Phalirido-Petasitetum officinalis*) that may or may not be mown and the remaining nine are all mown. The low-intensity management of the hay meadows, using only dung as a fertiliser, has resulted in semi-natural grassland plant associations that are listed as being of European Community

interest under the Habitats Directive: as mountain meadows (Natura 2000 code: 6520), acidophilous mountain *Nardus* pastures (Natura 2000 code: 6230) and basiphilous active peats (Natura 2000 code: 7230) (Tok, 1998, Sârbu, 2004).

History of the settlement

The absence of documentary evidence relating to the village before the 18th century leaves the origins of Moeciu de Sus open to speculation. It is possible that the location of the village on the border between Transylvania and Wallachia would have prevented any settlement until the 15th or 16th century, when both principalities became vassals of the Ottoman Empire. Prior to this time, frequent conflict in the area and the location of the valley between the legal border (lying along a high mountain ridge) and the enforced border (on the road) is likely to have created a virtual 'no-man's land' (personal comments: Florescu-Popovici and Pepene). Once the area was politically stable, population growth would have caused the expansion of ethnically Romanian peasants into the valleys and by 1732, the population of Moeciu de Sus had reached 250 (Praoveanu, 1998). It is probable therefore that some of the meadows of the village may have been created by the clearance of forest vegetation as long as 600 years ago.

In 1873, the Austro-Hungarian authorities introduced their land registration procedures into the area. Moeciu de Sus was mapped in this year and the owner of each parcel of meadow and of each pasture was denoted in land books as for the system implemented throughout Transylvania. When ownership changed hands, record of this was made in the appropriate land book. During Communism these land books were not updated as individuals did not in theory own land. Nonetheless, land continued to exchange hands, whether through inheritance, as a dowry, in cash transactions or in straight exchanges.

In the early part of the 20th century, it was common for men from the village to gain employment as either foresters or shepherds. Some of these shepherds were employed

by the owners of large estates to take flocks of sheep on long-distance transhumance to winter pastures in the south of Romania. This practice dwindled to a halt in the local area during communism, following the appropriation of land, the confiscation of stock and, in some cases, the imprisonment of wealthy land owners. The shepherding profession remained important in the local area, particularly for the communal herding of village livestock during the summers months and on state and collective farms in the lowlands. During the communist period, many men from the village worked as foresters whilst both men and women commuted daily to factories in nearby industrial centres.

Moeciu de Sus was one of the 2854 villages that were not collectivised during communism, all typically located in mountain communities (Rey, 1985). However, the villagers were obliged to transfer the majority of their produce to the state. For every milk cow owned, 800 litres of milk was taken by the state, a significant proportion of the 1000 litres of milk an average cow in the village annually produces. People were therefore forced to buy cheese from the state as they were left with insufficient quantities of milk to continue producing this at home. A kilogram of wool for every sheep was also taken by the state and carcasses of calves were exchanged for maize meal. The vet recalls that he was often asked to turn a blind eye to the birth of calves and a former local agricultural officer reported that it was common for households to declare fewer animals and hectares than they actually owned to escape the crippling effects of state quotas.

Fears that pasture land would be appropriated by the state led to the conversion of two areas of pastures into parcels of hay meadows. In 1958, the nationalisation of forests would have caused the dissolution of at least one '*obște*' in the village. *Obște* is the name given to a form of common pool management of resources that typically apply to delimited areas of forest that may also include pasture and grazing rights. Each member of an *obște* would have the right to harvest a certain percentage of the timber or for example, graze a certain number of cattle. Households may also have exclusive rights to a small parcel of forest but unless these could be legally defined as a meadow (e.g. a

former meadow that has naturally regenerated into woodland) they would also have been appropriated by the state. The removal of forest resources, particularly timber and fuel, is likely to have been a severe blow to smallholders and shepherds alike. Forest property rights have yet to be restituted to their former owners or descendants. The former *obște* in Moeciu de Sus is little known amongst younger residents in the village making the resumption of this form of resource management unlikely.

Pastures were subject to rules governing their management and some villagers recall that each family pasturing livestock were obliged to spend one or so days per year assisting in the maintenance of the pasture with tasks such as pulling saplings or unpalatable species. After the end of communism, it is said that these rules were dropped by mayoral candidates in a bid to win more votes, and smallholders are no longer required to assist in pasture management. Hay meadows remain managed as they would have been during communism. However, there has been a trend in the last fifty years to construct a second barn on larger meadows which lessens the distance that hay and dung has to be carried up or down steep slopes. This is said to have improved the fertility of some meadows.

In the late 1980s there were rumours that the village would be subjected to one of the most radical elements of the policy of systemisation. Legislation could be used to relocate entire communities if they were deemed to be insufficiently able to develop from a socio-economic perspective, a category that would have applied to many mountain settlements (Sampson, 1976). These rumours involved the conversion of smallholding land into ranch-like pastures. Villagers also mentioned the earmarking in the 1970s of the upper valley for the construction of a reservoir and that the building of houses higher than the centre of the village was restricted. Neither of these rumoured plans came to fruition.

In the 1980s, villagers applied nitrates to their hay meadows with the purpose of increasing yields of hay. This practice was rapidly rejected and smallholders report that the nitrates 'burnt' and 'damaged' the land, only producing a high yield of hay in the

first year and greatly reduced yields in subsequent years. They returned to the sole use of dung, the mode of fertilisation that is still practiced today. The relatively low-intensity of meadow use (fertilisation by dung and a maximum of two yields per year) has resulted in meadows with a diverse flora, including at least twelve species listed as rare or vulnerable on the Romanian Red List of Vascular Plants (Tok, 1998, Sârbu et al, 2004).

Present day Moeciu de Sus

The population of the village currently stands at just under 1000 people. The majority of 232 households in the village are also smallholding owners and cumulatively own approximately 700 hectares of hay meadows. There are four locally used upland pastures, three of which (*Poiana Lacului*, *Clăbutcel de Sus* and *Clăbutcel de Jos*) are locally administered commons used exclusively by livestock from the village. The fourth (*Padină*) is leased by a local shepherd from a private land owner and accommodates livestock from a number of local villages. The number of livestock in Moeciu de Sus (circa 450 head of cattle and 2000 sheep) exceeds the capacity of these four pastures and approximately 100 cows and 1000 sheep are sent to one of several, often privately owned and leased, pastures in the lowlands during the summer months. Since 1989, the numbers of sheep have fallen in the village, a trend common throughout Romania and precipitated by the disappearance of communist markets for wool. Many smallholders have not continued to replace older ewes because they are no longer worth the effort of their upkeep. The few households that continue to specialise in sheep production with flocks that may reach over a hundred animals in size, are invariably those of professional shepherds.

The growth of tourism in the village, since 1990, aided by the relative accessibility of the area to Bucharest and the county city of Braşov, has provided new sources of income and employment for people in Moeciu de Sus. A number of strategies, which are often combined, have arisen in response to this demand. Some households rent out spare

rooms as tourist accommodation (*cazare*) and others have renovated their houses specifically to open a small pension. Others may rent out rooms whilst in other employment. The popularity of the area as a tourist location has also led to a boom, particularly after the surfacing of the road in 2004, in the construction of holiday homes and pensions by people from outside of the village. Land prices in desirable valley areas in the wider locality are now some of the highest outside of Bucharest and many village inhabitants have sold low lying parcels of land. Despite the growth in tourism, there remains a strong economic rationale for the continuation of semi-subsistent pastoralism and hay making practices continue to maintain, in the village, semi-natural grasslands of both European and national importance.

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Paper 1: The influence of low-intensity hay production practices on the butterfly fauna of subalpine meadows in Romania

The influence of low-intensity hay production practices on the butterfly fauna of subalpine meadows in Romania

Abstract

Low-intensity hay making practices conserve significant areas of subalpine meadows in Romania. However, detailed understandings of the ecological relationships between land-use practices and the biodiversity of these habitats are lacking. This research investigated the influence of low-intensity hay production practices on the butterfly fauna of subalpine meadows in a village in the Romanian Carpathians. Patterns in the butterfly assemblages and vegetation height trends of meadows were investigated using the standard transect methodology. Land owners were interviewed to gauge levels of management intensity in each of the meadows in which sampling took place.

Ordination of the butterfly data indicated the significance of the timing of the hay cut and the importance of late mown meadows, fallows and unmanaged rocky calcareous grasslands in providing habitat for species in the second half of the summer. The date when a meadow was cut was determined by human factors in combination with environmental determinants (the labour capacity of the household, the topographical characteristics of the constituent meadows that form a smallholding and climatic and edaphic factors). Subtle variations in individual meadow management collectively introduce heterogeneity into the hay meadow habitats and landscape, for example, whether a meadow is managed for one or two cuts of hay. Higher intensities of management were negatively correlated with the number of autochthonous butterfly species recorded in a meadow (2005 data: $r_s = -0.714$, $p < 0.001$ and $df = 33$; 2006 data: $r_s = -0.667$, $p < 0.001$ and $df = 33$) but, at present, not all of a smallholding's constituent meadows are managed for two cuts of hay. This relationship provides a rationale for prohibiting higher than existing levels of dunging and the use of chemical fertilisers on smallholdings entered into agri-environment agreements or that will be subject to Natura

2000 legislation. However, the abandonment of meadows would appear to be a more likely scenario than their intensification.

Key words: butterflies, subalpine hay meadows, semi-natural grasslands, land-use practices, low-intensity farming, biodiversity conservation, Carpathian Mountains, Romania

Introduction

Research is beginning to draw attention to the diversity of semi-natural grassland plant and invertebrate species that are conserved by low-intensity agricultural practices in Romania. (Sârbu et al, 2004; Baur et al, 2006; Schmitt and Rákósy, 2007). Respectively, pastures, hay meadows and young grassland fallows are the optimum habitat of 94, 78 and 77 of the 184 butterflies occurring in the country as defined by Schmitt and Rákósy (2007). More than a quarter of species in this 'optimum' category, in each of these three semi-natural grassland habitats, are listed in the Romanian Red List of Butterflies (Schmitt and Rákósy, 2007). In contrast, arable habitats are the optimum habitat of only two species of butterfly (Schmitt and Rákósy, 2007).

The total area of semi-natural grasslands in Romania is estimated to be 2.6 million hectares (Sârbu et al, 2004). Of this, approximately 1.2 million hectares occur in the mountain regions which form a third of the national territory (Rey et al, 2001). In the lowlands of Romania, 50% of semi-natural grasslands were converted to arable or were used more intensively during the last century (Sârbu et al, 2004) but low-intensity agriculture remains the norm in the mountain regions (Schmitt and Rákósy, 2007). Low-intensity or traditional agriculture can be characterised by low inputs and low outputs per hectare (Beaufoy et al, 1994; Bignal and McCracken, 1996; Bignal and McCracken, 2000). Subalpine hay meadows in Romania are typically fertilised only with livestock dung and are mown by scythe. The steepness of many slopes and the high cost (relative

to income) of fuel, machinery and chemical fertilisers prohibit the intensification of winter fodder production and the purchase of concentrates.

Schmitt and Rákósy (2007) have evaluated the implication of both the intensification and abandonment of low-intensity agricultural land-use practices for butterfly species in Romania. These predictions are substantiated by the accumulation of data describing the decline in butterflies associated with semi-natural grasslands in western and central Europe (Asher et al, 2001; van Swaay, 2001; Stefanescu et al, 2005; Wenzel et al, 2006). Butterflies are sensitive indicators of the state of semi-natural grasslands (Erhardt, 1985) because the larval host plants of many species associated with this habitat occur only in nutrient poor conditions and decline with increasing levels of fertilisation and increased frequency of mowing or grazing (Zechmeister et al, 2003). The ploughing of semi-natural grasslands during the conversion of land to arable production or 'improved grassland' reseeded with a few selected species, e.g. perennial rye-grass (*Lolium perenne*) similarly results in a substantial reduction in plant species diversity and subsequent decline in butterfly species. An increase of arable land in Romania would have a negative impact on almost all of the butterfly species occurring in the country (Schmitt and Rákósy, 2007).

The abandonment of hay meadows, in contrast, is initially beneficial for butterfly species as levels of disturbance decrease in the absence of the mowing event (Baur et al, 2006). In the long term, however, fallow meadows become afforested and unsuitable for the majority of butterflies associated with semi-natural grasslands (Balmer and Erhardt, 2000). The fragmentation of semi-natural grasslands caused by the intensification and abandonment of their management disrupts the ecological processes that sustain plant, invertebrate and vertebrate species and makes them susceptible to local extinction (Fischer and Stocklin, 1997; see Tschardtke and Brandl (2004) for a theoretical overview). Fragmentation and isolation of habitats is more likely to affect specialist butterfly species, often reliant on a single or narrow range of host plants, specific environmental conditions and habitats (Wenzel et al, 2006). Alarmingly, there are also

indications that more generalist and widespread species are also declining as a result of changing agricultural practices (Asher et al, 2001; Léon-Cortés et al, 2000).

Agri-environment measures (AEMs) were introduced throughout the European Union (EU) in 1993 under regulation 2078/92 in an attempt to stem the declines in the biodiversity of farmland (Beaufoy et al, 1994). AEMs are voluntary but upon entry farmers receive payments for following management requirements that, in the case of biodiversity oriented schemes, aim to be beneficial to specified habitats or species. Since the inception of AEMs, it has been highlighted that the conservation of biodiversity on farmland would be better achieved by switching the focus of agri-environment support away from the de-intensification of farmland to the support of the remaining areas of low-intensity and 'high nature value' (HNV) farmland (Beaufoy et al, 1994; Bignal and McCracken, 1996; Tubbs, 1997; Bignal and McCracken, 2000). Evidence based advocacy has been successful in gaining the inclusion of high nature value farming systems in the 'improving the environment and the countryside' component of the EU Rural Development Programme (RDP) for the 2007-2013 period (2006/144/EC).

It is critical that the remaining HNV farming systems are supported by RDP measures. Conserving remnants of semi-natural grasslands has proven very difficult, if impossible, in areas where traditional land-use practices have become obsolete. Even if the need for conservation management of semi-natural grassland remnants has been recognised and addressed, it has often targeted one element of the biodiversity interest of a site. In the case of calcareous grasslands, conservation management has been overwhelmingly directed at flora and has neglected the requirements of invertebrates which benefit from a heterogeneity in vegetation structure (Wallies de Vries et al, 2002).

A narrow approach to the conservation management of sites cannot provide the necessary conditions for a range of species with contrasting ecological requirements (Wettstein and Schmid, 1999) and artificially replicating the high spatial and temporal variability that low-intensity land uses introduce into a landscape (Di Giulio et al, 2001)

is difficult to achieve. Furthermore, the artificial replication of low-intensity land-use practices by conservation management requires considerable financial resources and can be less cost-effective than supporting low-intensity farming practices (Poschold and Wallies de Vries, 2002). From a biodiversity conservation perspective, it is therefore imperative to direct support to the extant low-intensity land-use systems that still sustain significant areas of semi-natural grasslands.

The widespread preservation of low-intensity livestock production into the 21st century in the Romanian mountains is a consequence of political and socio-economic circumstance. Inherently unproductive terrain and the remoteness of villages made the collectivisation of land and subsequent intensification of agricultural land-use impracticable in mountain communities (Beck, 1976; Kideckel, 2000). Instead, households were obliged to produce for the state and severe quotas, later superseded by contracts, disproportionately disadvantaged landowners with large properties thus ensuring that holding sizes remained small. Following the end of communism in 1989, the collapse of the economy and concomitant loss of jobs increased the reliance of rural households on smallholdings and now, nearly twenty years later, there is still a strong socio-economic rationale for small-scale and semi-subsistent livestock production.

Over 800 000 or 85% percent of all households in mountain areas own agricultural land (RMARD, 2007). In 1985, a typical smallholding in mountain regions comprised of 2.4 ha of land and an average of 1-2 cows and 3 sheep (Rey, 1985). The average national holding size in Romania in 2007 is 2.2 ha (RMARD, 2007) and it is probable that the mountain holdings remain similarly small. Livestock production on these holdings can be described as semi-subsistent with much of the produce being consumed within the household. Nationally, 81.3% of all holdings in Romania consume more than 50% of their own production (RMARD, 2007). In this respect, the low-intensity management of land in the Romanian mountains is continuing out of necessity rather than by choice. This necessity will lessen as the economy of Romania develops and the trend of abandonment is already evident and mentioned as a point of concern, with respect to the

conservation of semi-natural grasslands, in the draft National Rural Development Programme (RMARD, 2007).

The support of traditional land use practices in Romania is now a possibility following the country's accession to the EU in January 2007 and the forthcoming implementation of AEMs that will target the conservation of HNV grasslands. However, there are few examples of the ecological relationships between low-intensity land use practices and the biodiversity of semi-natural grasslands with which to guide the development of AEMs. This research examined a pastoral production system in a mountain village in the Romanian Carpathians to:

- 1) Assess the butterfly assemblages associated with the village hay meadows;
- 2) Investigate the relationship between hay meadow management practices and the temporal and spatial patterns of the butterfly species assemblages;
- 3) Investigate the relationship between the number of butterfly species and the management intensity of meadows;
- 4) Highlight the implications of these findings for the development of agri-environment measures targeting the conservation of hay meadows and their associated species.

Study area and livestock production system

The village of Moeciu de Sus (25° 19' 46.89"E, 45° 26' 41.83"N) is located in the foothills of the Bucegi Mountains in central Romania. Livestock production in the village is smallholding based and generally semi-subsistent with most households retaining dairy produce for home consumption and generating income through off-smallholding employment. The 232 households are located in the base of two narrow river valleys that converge at the village centre at an altitude of just less than 1000m. The majority of households in the village manage smallholdings which are less than three hectares in size with all of the holding land dedicated to hay production. Hay meadows account for the overwhelming majority of all the agricultural land in the village surroundings, approximately 700 hectares in total. Most smallholdings are divided into at least two parcels of meadows which are rarely contiguous due to exchanges of land through inheritance, marriage and purchase. Each smallholding has at least one meadow that receives higher levels of dung and which is mown by scythe twice per summer. The higher meadows, up to an altitude of 1300 m, receive less dung and are mown once per year but provide an important grazing resource in the autumn. Mowing begins in earnest in July although the lowest meadows may be cut in late June.

Cattle and sheep are removed from the smallholding by the beginning of June to release both the land and labour for the production of hay. The lack of pasture in the midst of the village necessitates the short-distance transhumance of livestock by foot to local upland pastures or by lorry (in the case of cattle) to lowland pastures (short-distance transhumance movements are sometimes referred to as short-swinging or pendulation by Romanian academics (Drăgănescu, 1997; Praoveanu, 1998; Rey et al, 2001)). Here they are communally herded by shepherds specifically employed for this purpose. The village was not collectivised during communism, in common with mountain communities throughout the country, and hay meadows remained in 'private' ownership. The meadows have been managed at a low-intensity (with the use of dung only) since their creation following the clearance of forest (predominantly *Abies alba*, *Picea abies* and

Fagus sylvatica on the warmer and lower south west facing slopes) several hundred years ago. Nitrates were applied to many of the meadows in the 1980s but the villagers rejected this practice after a few years reporting that the chemical fertiliser 'burnt' the land and produced lower yields in the second year.

A classification of the vegetation of the hay meadows published in 1985 records the lowest meadows as eutrophic associations of *Trisetum flavescens*, *Festuca pratensis*, *Arrhenatherum elatius* and *Lolium perenne* (Anghel and Turcu, 1985). The hill slopes are described as mesotrophic *Festuca rubra* associations and oligotrophic *Nardus stricta* associations cover the upper slopes of one area (Anghel and Turcu, 1985). A more detailed study of the hay meadows using the Braun-Blanquet system of classification identified 11 different plant communities, within five vegetation classes and a total of 12 species classified as vulnerable or rare in the Romanian Red List of Vascular Plants (Tok, 1998, Sârbu et al, 2004). Several of these plant communities are listed as being of European Community interest under the Habitats Directive (92/43/EEC). The soils underlying the meadows are predominantly acid brown soils forming on crystalline schist with more localised areas of thin rendzinas forming on calcareous conglomerate. Precipitation is on average 700-800 mm per year with snow cover often lasting between December and March (Dumitru, 2003). The average annual temperature is less than 5°C (Dumitru, 2003).

Sampling methods

Butterflies

Eight linear transects, the majority with either a predominant north east or south west aspect were established in the study area (Table 1) with five passing exclusively through hay meadow habitats, one through a mixture of recently abandoned hay meadows and lightly grazed pasture and the remaining two through unmanaged calcareous rocky

habitats typified by thin skeletal soils and sparse swards and scrub. The two transects through these unmanaged calcareous rocky habitats were established to act as a point of comparison to the hay meadow habitats in terms of both butterfly species temporal and spatial distribution and in vegetation height trends. The transects followed the line of narrow paths to allow repeated sampling throughout the summer without damage to the hay crop. Sampling was therefore restricted to the medium and high meadows since lower meadows do not have linear paths running through them. The length of each transect was limited by the extent of suitable path (e.g. paths must be narrow to limit the potential influence of the path and must run through meadows rather than as a separate fenced corridor) and ranged between 283 m and 555 m (Table 1).

Each transect was divided into sections according to hay meadow boundaries or, in the case of the two scrub transects, by marked changes in vegetation type (Table 1 and Appendix C). The transects were walked according to the methodology described in Pollard and Yates (1993). The paths were walked at a steady pace and formed the centre of a 5 m wide corridor. All individual butterflies identified flying within 2.5 m either side of the path and 5 m ahead were recorded. The sighting was not recorded if uncertainty existed as to whether an individual had already been noted. Each transect was repeated eight times in 2005 (between May 29th and September 1st) and a minimum of six times in 2006 (between June 21st and August 21st). The sampling period and effort was less in 2006 than in 2005 due to poor weather conditions (Appendix D). To reduce effects of time of day and weather conditions all transects were sampled between 10 am and 4 pm when the following criteria were met: temperature $\geq 17^{\circ}\text{C}$ and $\geq 60\%$ transect section walked in sunshine (clear shadow on the ground) and wind speed < 5 on the Beaufort scale. These criteria were taken and adapted from those developed by Erhardt for subalpine habitats in Switzerland (1985).

The sampling was limited to Rhopalocera and nomenclature follows Tolman and Lewington (1997). Species difficult to identify on the wing were netted. Unidentified species which escaped the net were not included in the analysis. The difficulty of

distinguishing between some similar fast flying species on the wing reduced the overall numbers recorded of the following species: *Argynnis aglaga*, *A. niobe*, *Colias hyale*, *C. chrysotheme*, *Pieris brassicae*, *Artogeia rapae*, *Hesperia comma*, *Thymelicus sylvestris* and *T. lineola*. In total, 1, 266 individual butterflies were not included in the analysis (Appendix A).

Table 1. Characteristics of each of the eight butterfly transects. A total of eight transects and 35 transect sections were sampled in 2005 and 2006.

Transect Code	Category (type and number of transect sections)	Transect length (m)	Start and finish altitude (m)	Aspect
AS	Hay meadows (9)	555	1040-1058	SW
ASE	Unmanaged rocky scrub (1) and grassland (1)	300	1124-1069	SW
ACO	Hay meadows (5)	410	1097-1031	NE
NB	Hay meadows (4)	477	1176-1229	NE
SB	Hay meadows (4)	411	1232-1227	SW
F	Hay meadows (5)	517	1105-1140	E
FM	Unmanaged rocky scrub (1) and hay meadow margin (1)	283	1201-1202	E
FP	Abandoned hay meadows (2), lightly grazed pasture (1), spring and rocky scrub (1)	433	1123-1207	NE

Vegetation

Vegetation height sampling was repeated three times each during the summers of 2005 and 2006, once in June, July and August. The vegetation of the transect section was stratified (by eye) according to the uniformity of vegetation height typically into two or three subsections. Four measurements were taken within each subsection using the direct method. An overall mean for the transect section was then calculated using the means of each subsection. The direct method is more suitable for situations in which there may be short turf (e.g. following the mowing of hay) in comparison to the sward stick and drop

disk methods (Stewart et al, 2001). The direct method entails recording the height of the sward at the point below which 80% of the vegetation is estimated to be growing (Stewart et al, 2001).

The percentage cover of *Anthyllis vulneraria*, the host plant of *Cupido minimus*, was estimated for each transect section in 2005 to investigate the potential factors affecting the occurrence of this specialist butterfly species.

Management characteristics

Data obtained from interviews with meadow owners or users was combined with observational data to derive a management score for each transect section (Table 2). The management score was used to investigate the relationship between the number of autochthonous butterfly species (breeding in the study area) and the intensity of transect section use. The maximum possible score using the criteria listed in Table 2, at the current levels of smallholding management, is 9 because some of the high scoring criteria are mutually exclusive e.g. a meadow cut twice per year could only score a maximum of 3 for grazing.

Precise measures of the intensity (livestock units per hectare) and duration of grazing were not derived from observational or interview data. Instead, the three categories used in this analysis, low, medium and high, are defined as:

- Low: grazing of livestock for two to three months per year e.g. either in the spring or autumn,
- Medium: grazing of livestock for five months e.g. both the spring and autumn,
- High: grazing of livestock in the spring, summer and autumn.

Table 2. Calculation of the management intensity scores for each meadow and non-meadow transect section. Each transect section was assigned a score for grazing intensity and duration, frequency of mowing and the intensity of fertilisation according to the criteria listed in this table. These scores were summed to provide an overall aggregate score for each transect section.

Grazing intensity and duration	Score
No grazing for at least three years (previous to and including 2005)	0
Very infrequent grazing	1
Low grazing	2
Medium grazing	3
High grazing	4
Frequency of mowing	Score
Not cut for at least three years (previous to and including 2005)	0
Not cut every year in the last three years	1
Entire meadow cut once per year	2
Entire meadow cut once per year plus half or less cut twice	3
Entire meadow cut twice per year	4
Intensity of fertilisation	Score
No dung spread for at least three years (previous to and including 2005)	0
Low dung input (not dunged every year in the last three years or less than half the meadow lightly dunged every year)	1
Medium dung input (rotational - half to 3/4 of a meadow dunged every year, insufficient dung to fertilise the whole meadow each year)	2
High dung input (enough dung to fertilise the whole meadow every year)	3
Slurry or chemical fertilisers used	4

Statistical analyses

Detrended correspondence analyses (DCA) (Hill, 1979) were performed on the butterfly assemblage data to help objectively identify transect sections with similar butterfly

species compositions. In each year, the butterfly data were pooled for the surveys conducted in June, July and August. DCA analyses were then conducted for each of these three periods to investigate temporal changes in both the flight periods of butterfly species and relationships with the management of the transect sections.

Poor weather in 2006 prevented sampling in June in this year and for this reason it was not possible to divide the data into June, July and August categories. The DCA analyses of results presented here are accordingly limited to 2005 data only. Butterfly counts for each transect section were firstly standardised to the number of individuals recorded per 100 m to reduce the influence of marked differences in the number of individuals observed between sections of different lengths. Secondly, the standardised butterfly data for each section was then converted into the proportion of the total butterfly observations in that transect section in that time frame. The DCA analysis was therefore conducted on this proportion data, as opposed to the raw abundance data. The ordinations were run with the option of down-weighting rare species to reduce the influence on the analyses of species that were observed infrequently.

The mean vegetation heights of each transect sections for the June, July and August sampling dates were plotted on graphs to illustrate the vegetation height trends occurring within each transect.

A Spearman's rank correlation was conducted to investigate the relationship between the ranked percentage cover of *Anthyllis vulneraria* in each transect corridor section and the ranked number of *Cupido minimus* adults observed in each transect corridor section during June 2005. Transects were sampled three times in June 2005 for adult *Cupido minimus* and the mean number, standardised to 100 m, was calculated for each transect section and used in the correlation.

Further analyses of butterfly data were conducted on two categories of species: autochthonous (breeding in the study area) and highly mobile. In the highly mobile

category, seven species can be classified as widespread and common or as a migrant (*Pieris brassicae*, *Artogeia rapae*, *Vanessa atalanta*, *Aglais urtica*, *Inachis io*, *Vanessa cardui* and *Issoria lathonia*) (Tolman and Lewington, 1997). *Apatura iris*, a species recorded only once in the study area and typical of deciduous woodlands, was also segregated into this category, as was *Gonepteryx rhamni*, a species that is relatively mobile and for which no record of the larval host plants occurs in the area.

The relationship between the number of butterfly species in both categories and the management intensity of each transect section was investigated on data from both years using Spearman's rank correlation, as the management intensity scores are on an ordinal scale. A Pearson's correlation was used to investigate the relationship between the number of butterfly species, on segregated data (autochthonous and highly mobile), and the number of days that a transect section has remained uncut by a specific butterfly sampling period in late August in 2005 and 2006. In both of these correlations, the number of species was not standardised to 100m for each transect section (to account for variations in transect section length).

Results

In 2005 and 2006, 2,007 and 2,230 individual butterflies were respectively identified and recorded (Appendix B). 46 species in total were recorded on the transects over the two years, 42 species in 2005 and 41 in 2006 (see Appendix B). In 2005, the mean number of species per transect was 22.1 (± 3.3 SD) and in 2006 was 24.8 (± 6 SD). Of the 46 species recorded over the two years, nine are classified in this study as highly mobile and widespread and 37 as autochthonous in semi-natural grassland habitats. Ten of the species recorded are listed by van Swaay (2002) as being characteristic of calcareous grassland (Appendix B). Of these, *Maculinea rebeli* is particularly associated with calcareous grasslands in Europe. This monophagous species was only recorded in one location in the study area, a calcareous rocky habitat in which the larval host plant,

Gentiana cruciata was abundant but limited in distribution to the borders of a lightly used path. Three of the 37 species, *Erynnis tages*, *Lycaena alciphron* and *Maculinea rebeli*, are classified as vulnerable on the Red List for Romanian Butterflies (as detailed in Schmitt and Rákosy, 2007) (Appendix B).

Management intensities of transect sections

Table 3. Overview of the management intensity of each transect section. These scores are based on a combination of interview of land owners and users and direct observation. High aggregate scores denote a higher intensity of management.

Aggregate Score	Score by category			Transect sections*
	Grazing	Mowing	Fertilisation	
0	0	0	0	ASEBB, ASEAB, FMS
1	1	0	0	FPU, FPD, FPF, F3
2	2	0	0	FPC
3	1	2	0	AS1
3	1	1	1	ACO3, SB2
4	2	1	1	ACO4, NB3
5	2	2	1	AS3, SB3
6	1	3	2	AS6
6	2	2	2	SB1, SB4, F1, F2, FMHM
7	0	4	3	AS5, ACO5
7	2	3	2	AS2, AS4, F5
8	2	4	2	AS8
8	2	3	3	NB4
8	3	3	2	ACO1, ACO2, NB2, F4
9	3	4	2	AS7, AS9, NB1

*See Appendix C for an explanation of the transect section codes

Of the 35 transect sections, 14 scored 7 or more (all hay meadows), ten scored 4, 5 or 6 (all hay meadows) and 11 scored 3 or less (five hay meadows including two which have not been cut for more than three years, pasture and unmanaged rocky scrub and grassland). For both sampling years a significant negative correlation between the intensity of management and the number of autochthonous species was observed (2005: $r_s = -0.714$, $p < 0.001$ and $df = 33$ and 2006: $r_s = -0.667$, $p < 0.001$ and $df = 33$) indicating that there are fewer of these species on more intensively managed sections. This relationship is weaker but still significant for highly mobile species (2005: $r_s = -0.370$, $p < 0.05$ and $df = 33$ and 2006: $r_s = -0.449$, $p < 0.05$ and $df = 33$). The number of butterfly species was not standardised to 100 m in both this correlation and in the correlation of number of species with the number of days a transect section has remained uncut. It is possible, therefore, that the variation in the length of transect sections is influencing the number of species recorded as it would be expected that more species would be recorded in longer transect sections reflecting a greater sampling effort.

Management intensity and butterfly species composition of transect sections

Detrended correspondence analyses (DCA) of butterfly data for June, July and August in 2005 revealed both temporal and spatial patterns in the species composition of transect sections. The mean number of species per transect section after pooling data in June, July and August is, respectively, 4.1, 7.7 and 3.5. Caution was taken when interpreting the ordinations to take into consideration the potential influence of a low number of species on the location of the transect section on the plot. Although the number of individuals of each species recorded in each transect section for each analysis period (June, July and August) were standardised to numbers per 100 m, the number of species was not corrected according to section length. It can be assumed that more species will be recorded on longer transect sections and that shorter transect sections may not therefore be accurately represented in the ordination plot. The data was analysed with

this potential source of bias in mind and is considered to be sufficiently robust to use as a basis for the ecological interpretations.

June

DCA of the June 2005 butterfly data produced eigenvalues of 0.46, 0.24, 0.18 and 0.10 for axes 1, 2, 3 and 4 respectively (and correspondingly, the variation accounted for by these axes accounted for 19.6, 10.2, 7.5 and 4.1%). Analysis of the data was restricted to axes 1 and 2 (Figure 1) which accounted for over 29% of the variation. In Figure 1 transect sections are separated into three clusters along axis 1.

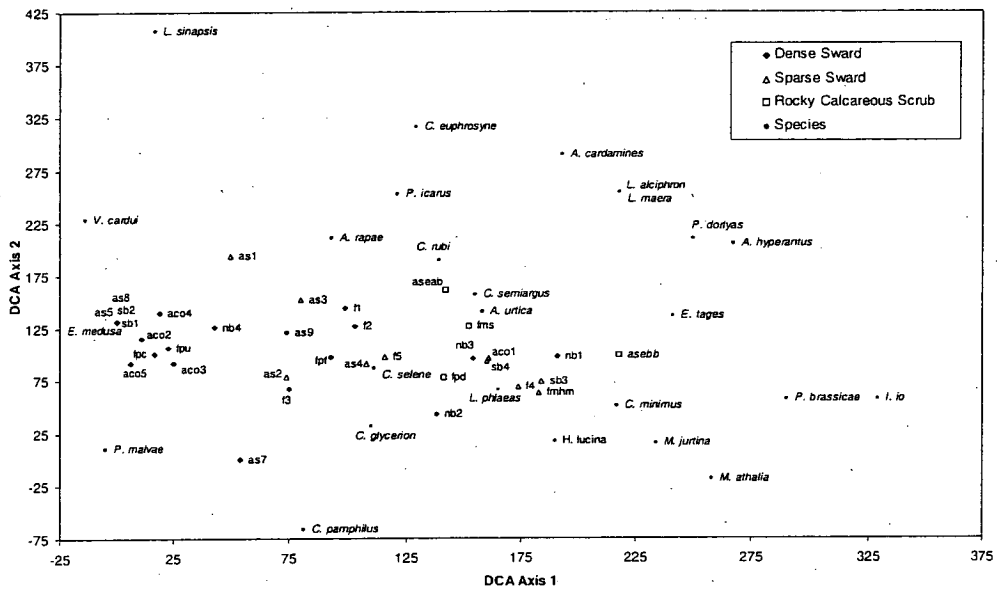


Figure 1. DCA ordination plot of pooled June butterfly data.

On the left hand side of axis 1 is a cluster of transect sections characterised in particular by the occurrence of *Erebia medusa*, *Vanessa cardui* and *Pyrgus malvae*. This cluster only contains hay meadows except for one section of lightly grazed pasture. These meadows varied in the intensity of their management but are typified by dense swards, either well fertilised by dung or poorly fertilised but dense *Nardus stricta* dominated swards. *Erebia medusa* occurs in a diverse range of grassy habitats (Tolman and Lewington, 1997) and two of the species' four larval host plants, *Festuca ovina* and

Festuca rubra occur in the study area in a range of hay meadow plant communities (Tok, 1998). *Vanessa cardui* is a highly mobile species with a substantial range of larval host plants and is not subsequently useful in characterisation of transect sections. Three of the host plants of *Pyrgus malvae* have been recorded in the area: *Potentilla argentea*, *Potentilla erecta* and *Fragaria vesca* (Tok, 1998). *Potentilla erecta* is a species typical of sites low in nitrogen (Ellenberg, 1988) and is listed by Tok (1998) as a plant that is strongly indicative of the *Polygalo-Nardetum*, *Polygono-Trisetion* and *Astrantio-Trisetetum* hay meadow communities that occur in Moeciu de Sus, all of which can be characterised by dense swards.

On the right hand side of axis 1 the cluster of transect sections, which includes the unmanaged rocky calcareous grasslands, are characterised by a greater number of species and in particular, *Cupido minimus*. Local population sizes of this highly sedentary species in calcareous grasslands have been positively correlated to the cover of its single larval host plant, *Anthyllis vulneraria* (Krauss et al, 2004). In this study, a Spearman's rank correlation of percentage cover of *Anthyllis vulneraria* and the number of adult *Cupido minimus* individuals found a highly significant positive relationship ($r_s 0.739$ $p < 0.001$ and $df = 33$) indicating that the abundance of *Cupido minimus* is greater in transect sections with a higher abundance of *Anthyllis vulneraria*. *Anthyllis vulneraria* typically grows in calcareous or coastal grasslands where sparse or eroding vegetation provides the necessary conditions for seedling establishment (Asher et al, 2001).

July

DCA of the July 2005 data produced eigenvalues of 0.31, 0.19, 0.10 and 0.08 for axis 1, 2, 3 and 4 respectively and accounted for 19.4, 12.0, 6.6 and 4.8% of the variation in the dataset. Axes 1 and 2 account for 32 % of the variation in the data set and are only considered here (Figure 2). In contrast to June, only one main cluster of sites was apparent. The less clear division between sites according to the edaphic and management factors which dictate the density of sward probably reflects the wane of early flying

specialist species and the emergence of butterflies which are less constrained in their ecological requirements in grassland habitats (e.g. the polyphagous grass feeder *Aphantopus hyperantus*) and which can therefore occur in both rocky calcareous habitats and meadows with denser swards.

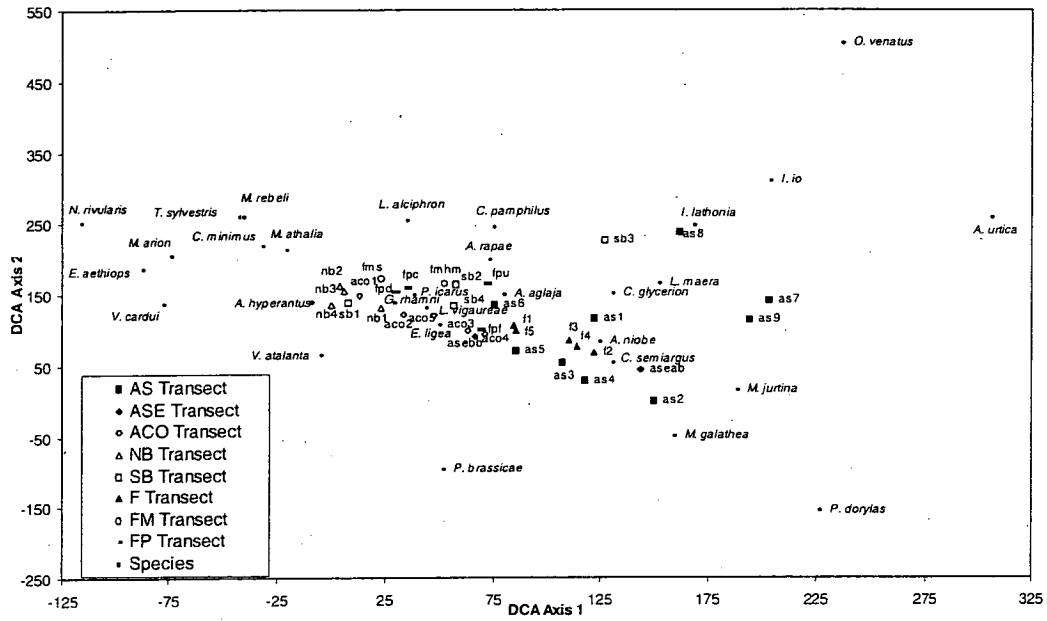


Figure 2. DCA ordination plot of pooled July butterfly data.

The separation of transect sections along axis 1 appears to be driven by cutting dates. Within the main cluster, NB, ACO and F meadows are loosely grouped within their transects with the earliest cut meadows on each transect located towards the left of their grouping plot and the later cut meadows orientated towards the right. Accordingly, the polyphagous *Aphantopus hyperantus* (main flight period in July) is located on the left of the plot while the later flying *Maniola jurtina* and *Melanargia galathea* (both of which are also polyphagous grass feeders but which emerge later than *Aphantopus hyperantus* in the study area) are located to the right of the plot. The loose grouping of meadows within their own transects suggests that between transect differences in species composition are more pronounced than within transect differences. The F transect,

which is situated more towards the right of the main cluster, as a whole is cut later than both NB and ACO which are cut in a similar time frame. However, the sections within a transect are not independent and this factor may contribute to their grouping in close proximity to one another. At the level of the transect, it is possible that factors such as altitude, aspect and geology may interact with and even mask the influence of management practices requiring a certain amount of caution to be placed on attributing the differences seen to variations in management practices alone.

The three transect sections characterised by rocky calcareous habitats are not clustered together. FMS and FPD are situated towards specialist mid-summer species (e.g. *Maculinea rebeli* and *Mellicta athalia*) and towards *Cupido minimus* whilst ASEBB is located towards more generalist species (*Argynnis spp*, *Maniola jurtina* and *Melanargia galathia*). ASE is south facing and lower in altitude than the FMS and the FPD section and this might result in the earlier desiccation of the host plants of *Mellicta athalia* and *Cupido minimus*.

August

The August data produced eigenvalues of 0.55, 0.35, 0.24 and 0.12 respectively for axes 1, 2, 3 and 4 which accordingly account for 16.0, 10.5, 7.4 and 3.9% of the variation (Figure 3). Note that five meadows are not present on Figure 3. No butterflies were recorded on ACO2 and NB2 and were therefore omitted from the analysis. NB1, NB4 and F5 were manually removed from the data set as the recording of only one individual species (all highly mobile species) on each of these three meadows resulted in a highly skewed DCA plot.

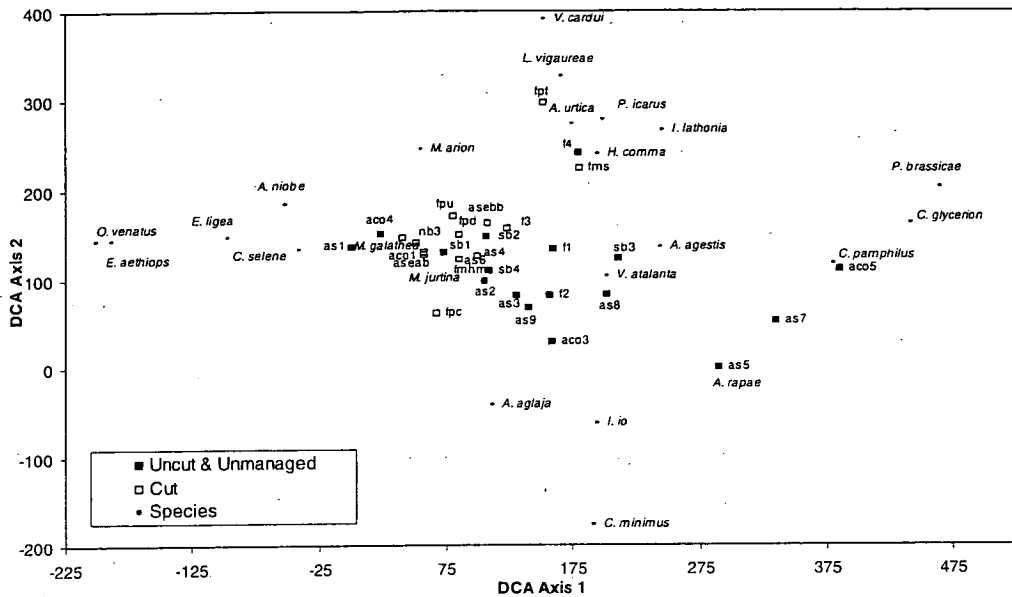


Figure 3. DCA ordination plot of pooled August butterfly data.

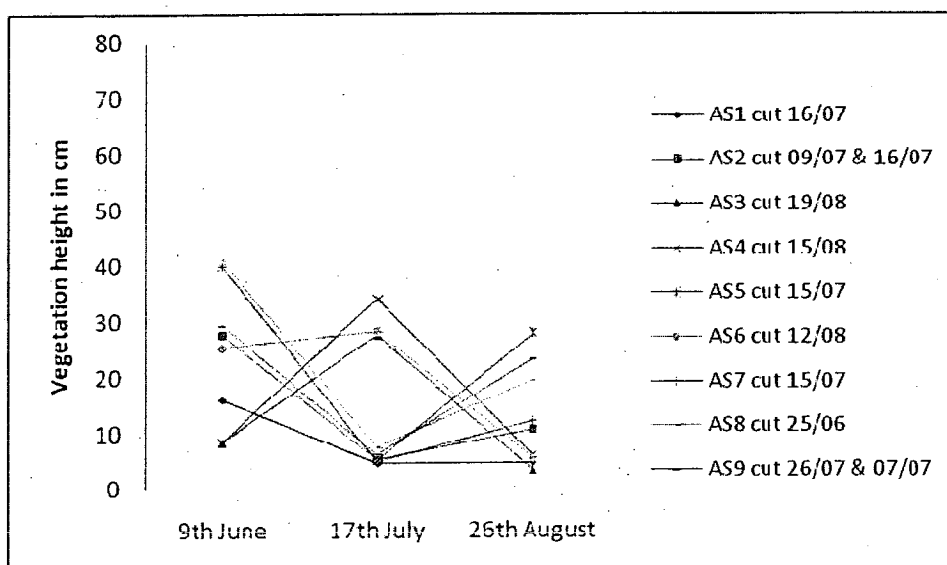
The August ordination has one central cluster of sites comprising late cut meadows (ACO1, SB2, NB3, AS3, AS4 and AS6), an uncut meadow (F3), the scrub section of the ASE transect (ASEBB) and three of the FP transect sections (uncut meadows FPU and FPF and one lightly grazed pasture section FPC) all of which are aligned with *Melanargia galathea* and *Maniola jurtina*.

Some of the earliest cut meadows of the AS transect (AS2, AS7, AS8 and AS9) are located on the plot in contrast to several more recently cut meadows in which no species were recorded. This suggests that the regrowth of vegetation in early cut meadows provides nectar and possibly breeding resources for butterflies in late summer. The presence of butterflies in these meadows might also be enabled by the existence of late cut meadows on the same transect.

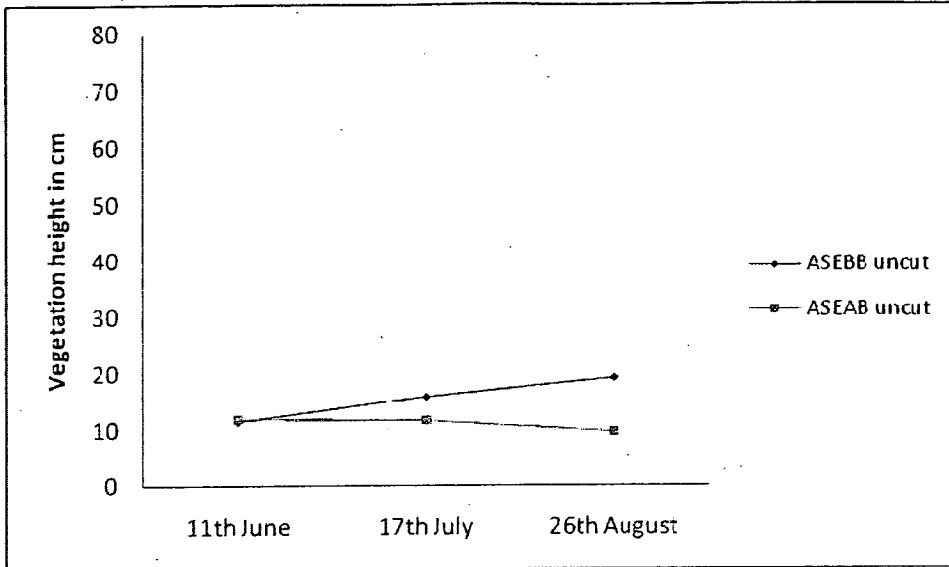
Pearson's correlation on the number of autochthonous species and the number of days a transect section has remained uncut shows a significant positive relationship ($r_s=0.599$, $p<0.001$ and $df = 33$). This indicates that the shorter the sward, the fewer the number of species and vice versa. This relationship is not significant for highly mobile species. Earlier cut meadows tend to have higher management scores although it is possible for a meadow with a high score to be cut later if it is higher in altitude or more distant than a similarly managed meadow on the same smallholding.

Vegetation height

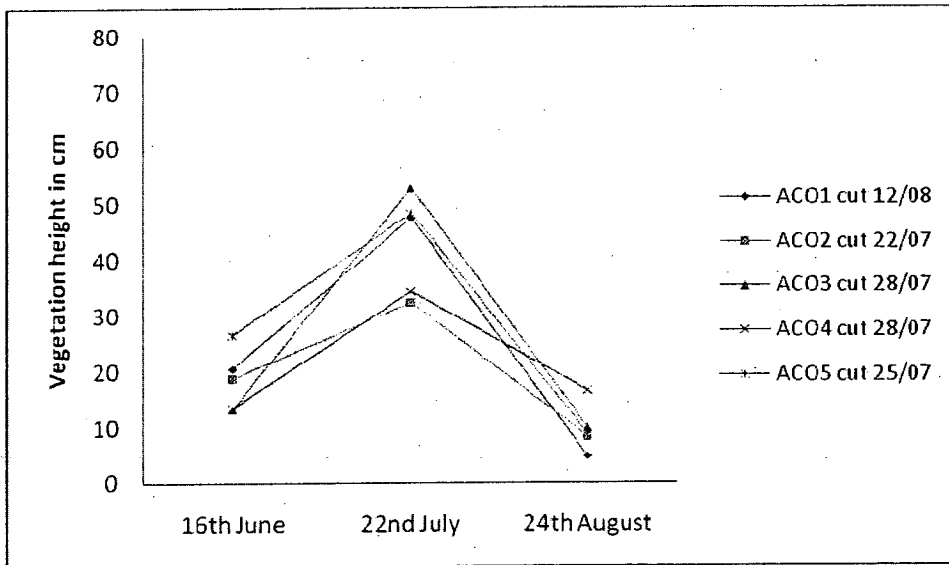
The data are not directly comparable between years and within each year (sampling dates were not fixed). Nonetheless, Figures 4 and 5 provide a useful illustration of the variation in vegetation height trends both within a transect and between transects.



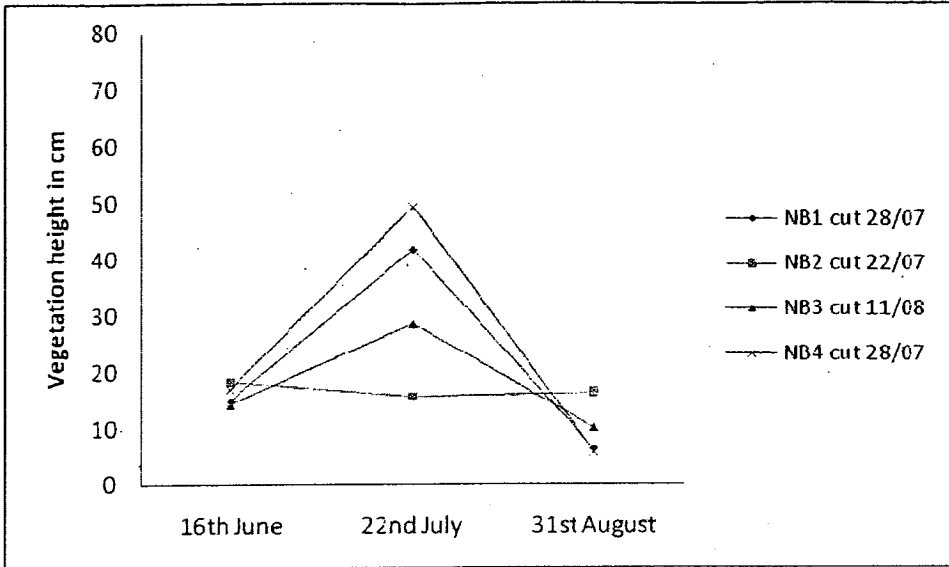
a) AS



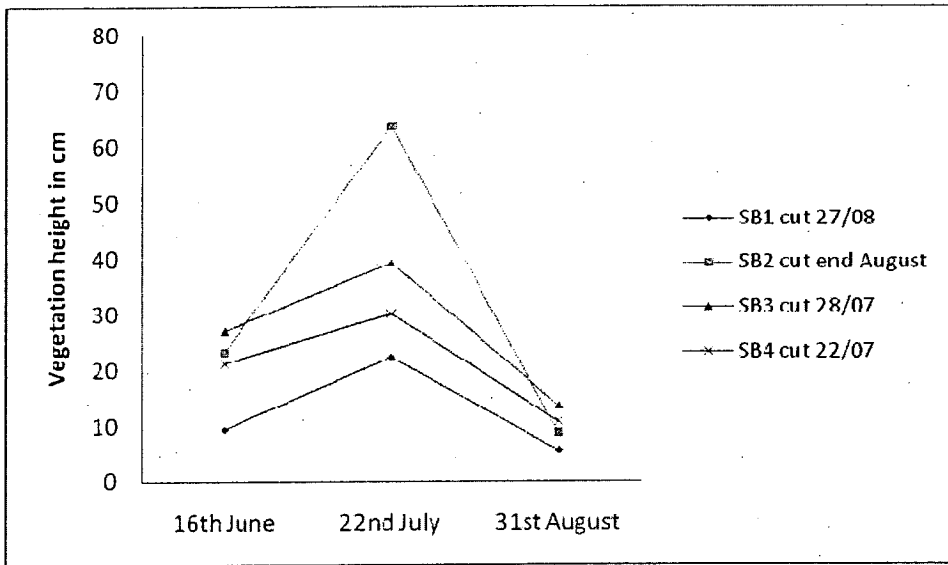
b) ASE



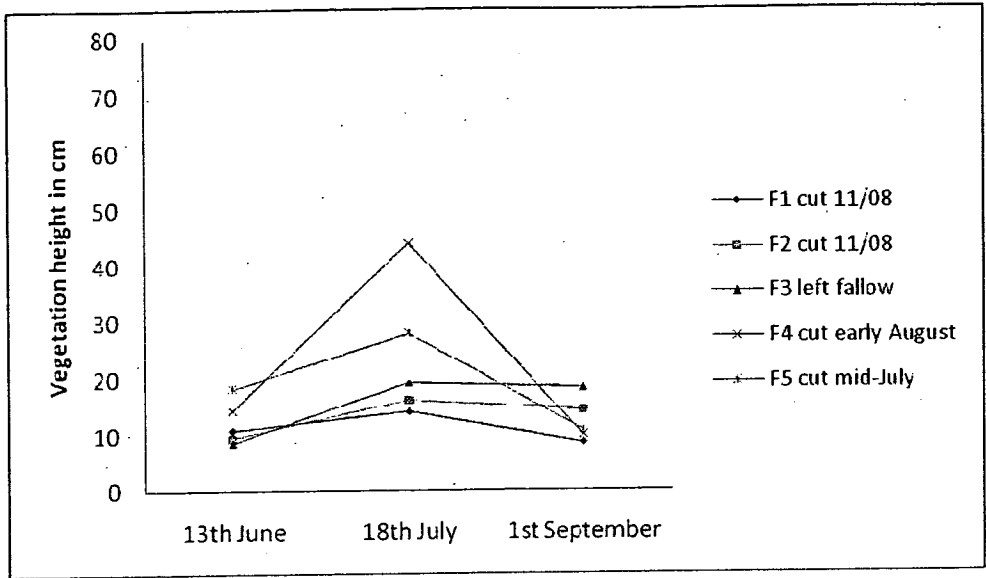
c) ACO



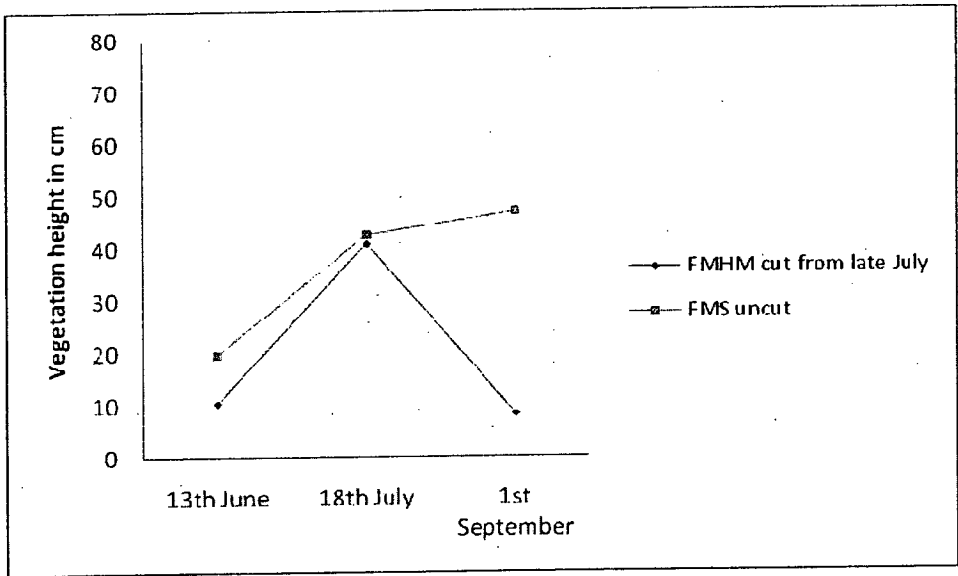
d) NB



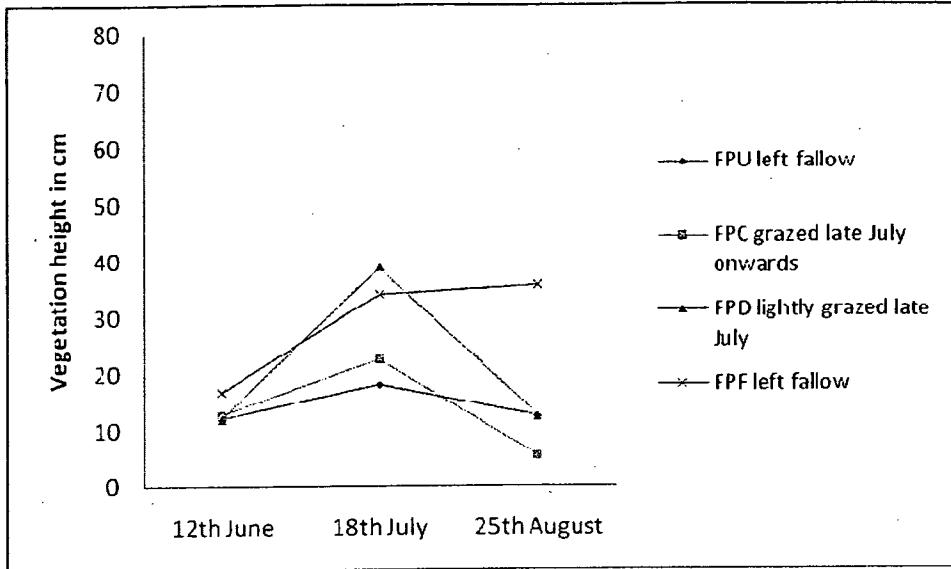
e) SB



f) F

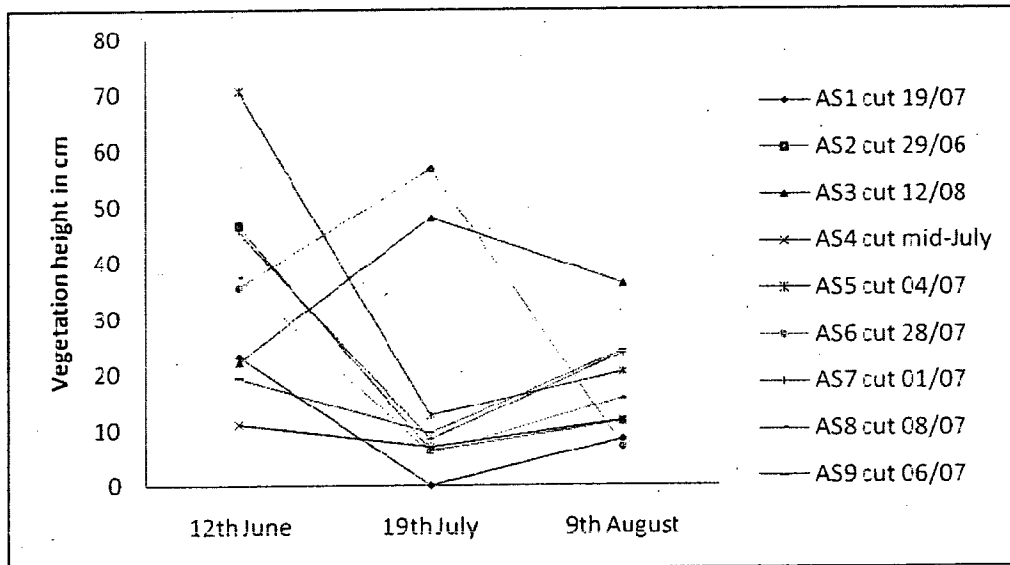


g) FM

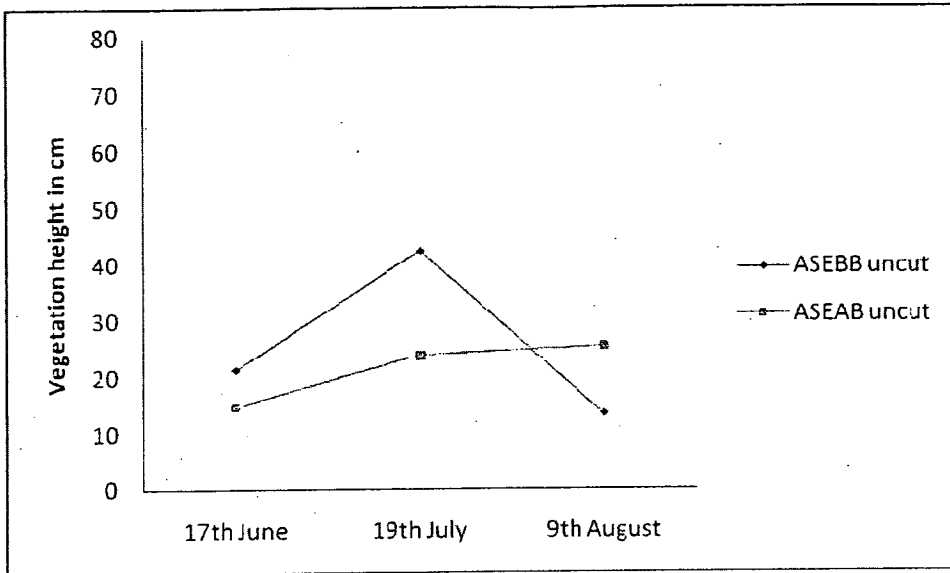


h) FP

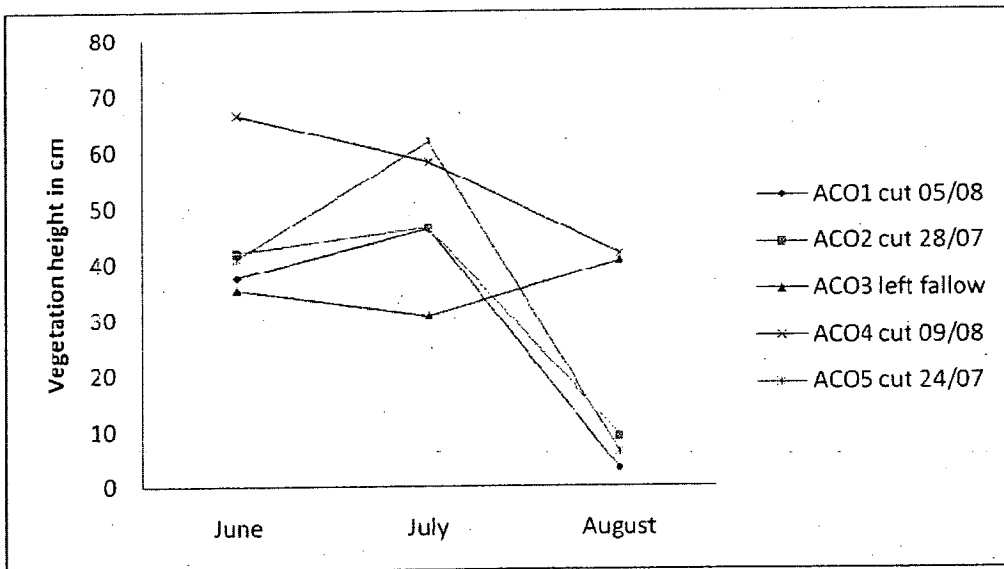
Figure 4. Vegetation height trends and cutting dates for each transect section, organised by transect, in 2005.



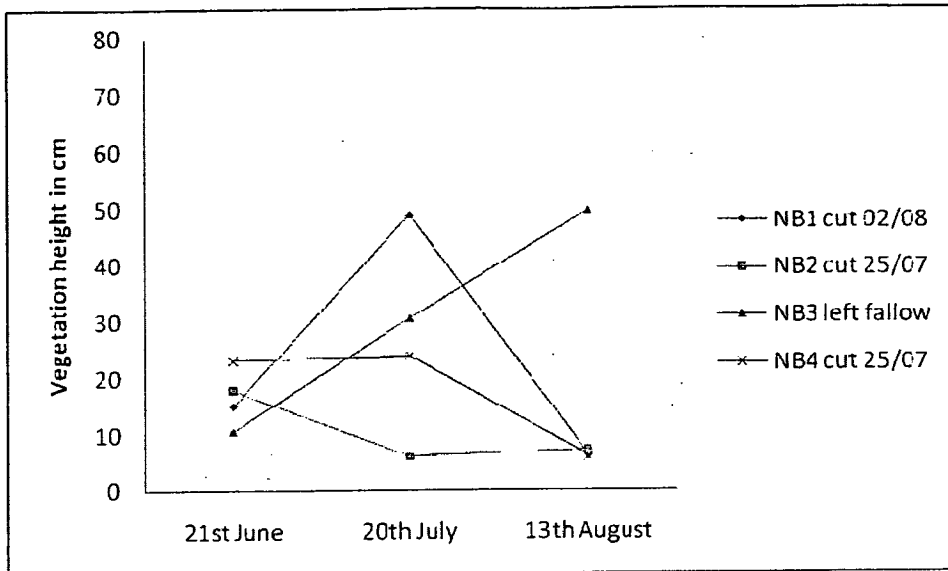
a) AS



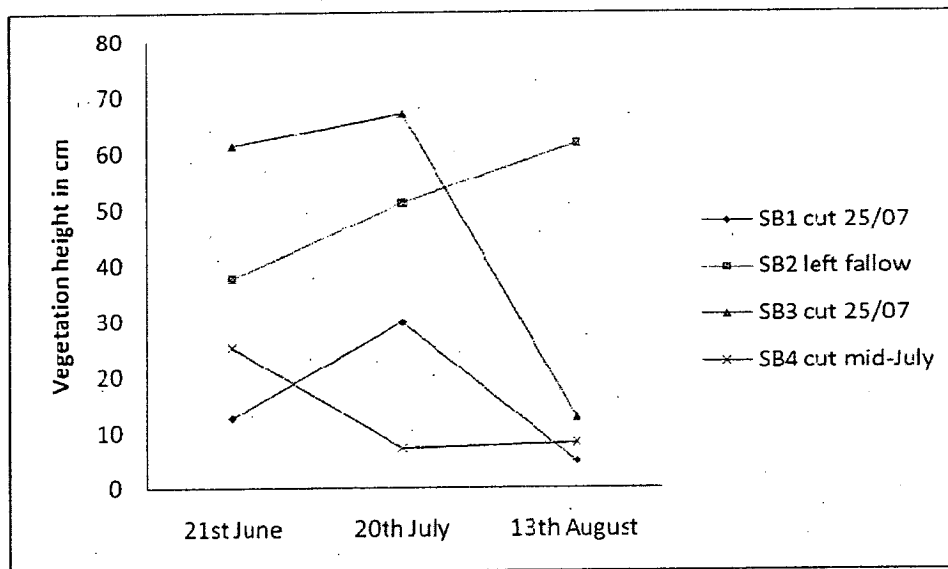
b) ASE



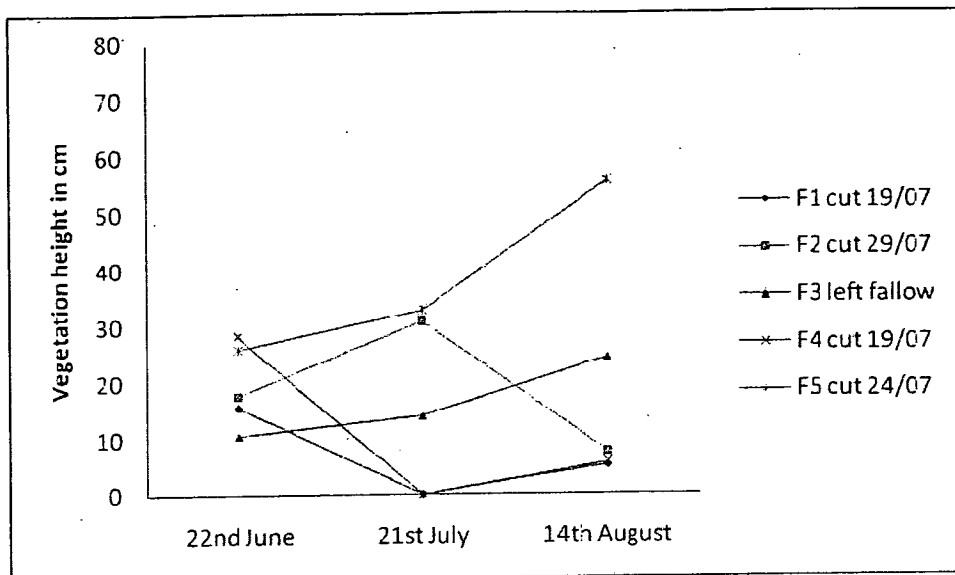
c) ACO



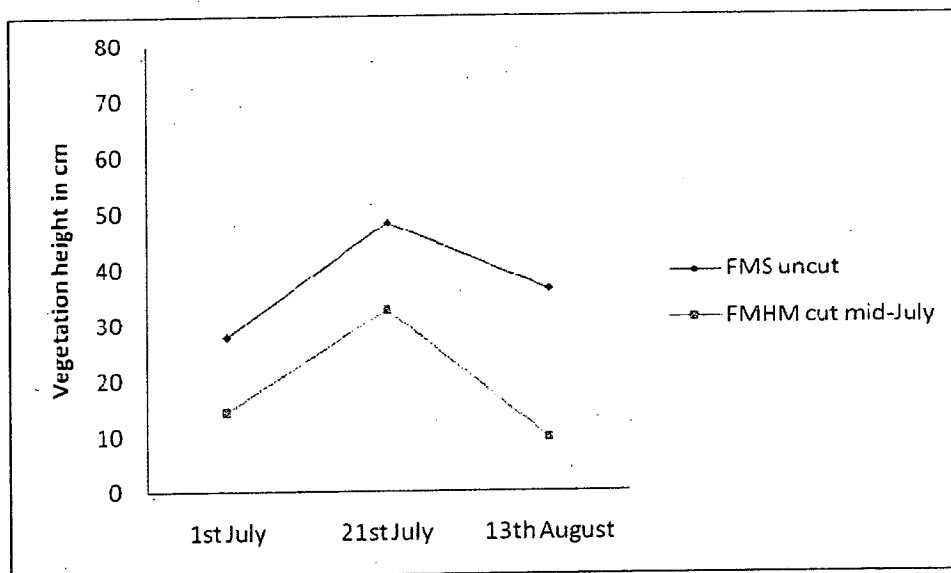
d) NB



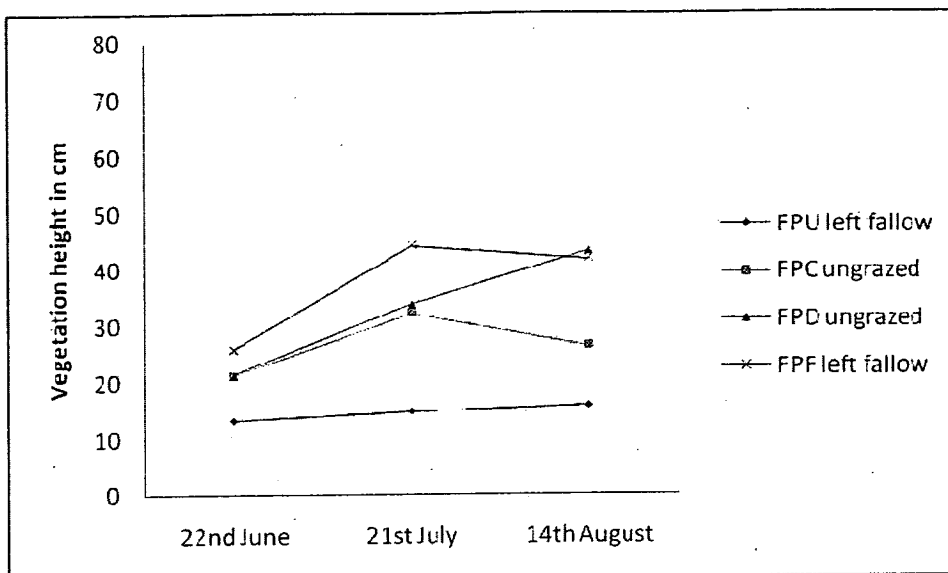
e) SB



f) F



g) FM



h) FP

Figure 5. Vegetation height trends and cutting dates for each transect section, organised by transect, in 2006.

Eight vegetation height trends are evident in the transects during the course of the two summers indicating that there is heterogeneity in sward heights between transect sections. This heterogeneity is caused both by the presence of managed and unmanaged parcels of land and in the case of managed parcels, the timing of the hay cut.

In 2005, the predominant vegetation height trend was July > June > August with the swards of over half of the 33 transect sections following this pattern. All of the transect sections adhering to this trend were mown meadows except for FPC, a pasture grazed in this year from late July onwards (Figure 4 h). The dominance of this trend reflects the concentration of sampling in mid to high altitude meadows which are cut from mid to late July onwards. In contrast, five meadows from AS (Figure 4 a), the lowest of the eight transects which also has a south-west aspect, show a differing trend with vegetation highest in June (June > August > July) reflecting the earlier cutting dates of these meadows. However, despite the lower altitude of this transect, three of the meadows (AS3, AS4 and AS5) in 2005 exhibit the July > June > August trend as they are cut at times more typical of higher altitude meadows. The three transect sections that

demonstrated an August>July>June vegetation height trend (ASEBB, FMS and FPF) are unmanaged scrub and a fallow meadow none of which were grazed or mown.

In 2006, seven transect sections followed the August>July>June vegetation height trend all except F5 were neither mown nor grazed. F5 (Figure 5 f) was mown but recorded a high vegetation height measurement in August due to the presence of unmown and tall vegetation located around a spring. As for 2005, mown meadow vegetation height trends were divided between July>June>August (10 mid to later mown transect sections) and June>August>July (9 earlier mown meadows). The increase in the number of meadows mown earlier compared to 2005 may reflect the better weather in June and early July in 2006.

Discussion

This research demonstrates the high nature value of managed and unmanaged semi-natural grasslands in Moeciu de Sus. The diversity of butterfly species recorded in this research corroborates the high diversity of plant species in the hay meadows of the village recorded by Tok (1998). The presence of localised areas of calcareous soils explains the incidence of 11 butterfly species associated with these edaphic conditions (these are listed in Appendix B). *Cupido minimus* occurs in meadows with more calcareous soils in early summer in medium and high altitude meadows. Further research is required to investigate the characteristic assemblages of the lowest meadows which receive higher levels of dunging and which are cut earlier in the summer. The timing of the hay cut is the predominant factor determining the distribution of species in the latter half of the summer. Later cut meadows, recently abandoned meadows and more natural rocky calcareous grasslands are important in providing habitat for later emerging species including *Melanargia galathea* and *Hesperia comma*. The number of autochthonous butterfly species declined with an increase in the intensity of hay meadow management but not all of the meadows of a smallholding are managed at a higher intensity. However, this relationship provides a rationale for prohibiting higher levels of dunging

or the application of slurry or chemical fertilisers in the management requirements of AEMs and Natura 2000 sites. Higher levels of fertilisation will decrease the diversity of plant and, hence, butterfly species and could act to homogenise variation in cutting dates.

Temporal and spatial patterns of butterfly species assemblages

In June, the management intensity of a meadow was found to be less important than edaphic characteristics in determining the butterfly assemblages of transect sections. The specialist and monophagous butterfly *Cupido minimus* illustrated the importance of edaphic factors in determining the distribution of butterfly species in meadows during this period. In this study area suitable conditions for the species' larval host plant, *Anthyllis vulneraria*, were found in rocky calcareous habitats (ASEBB, ASEAB, FMS, FPD) and in the meadows with sparse swards on calcareous soils (F4, F5, AS2, AS3, AS4, SB3 and SB4) However, *Anthyllis vulneraria* was also found in a few meadows, particularly on the NB transect, which do not have sparse swards or thin calcareous soils and which are managed at a high intensity. *Anthyllis vulneraria* plants in these meadows are concentrated in their distribution around gateways where the incidence of trampling by cattle is highest and has provided the necessary conditions for seedling establishment.

Analyses of the July and August butterfly data confirmed the adverse effect of the mowing event for adult butterflies (Erhardt, 1985; Di Giulio, 2001). The uniform removal of vegetation from a meadow eradicates both feeding and breeding habitat for adults and, although not investigated here, will cause mortality in immature stages. The only autochthonous butterfly species that was regularly recorded in recently cut meadows was *Maniola jurtina* corroborating reports of this behaviour in Asher et al (2002). While the cutting event has a dramatic impact at the level of the meadow, the potential variation in mowing dates in the study area results in the existence of parcels of unmown vegetation in the landscape in late summer. At least one meadow was cut late

or has been recently abandoned on each hay meadow transect in 2005. In 2006, one meadow remained uncut on each of four transects and on the fifth, three meadows were cut late. These late mown and fallow meadows, in combination with unmanaged patches of calcareous scrub, provide pockets of taller swards in the landscape and potential resources for species with flight periods in late July and August.

However, the data indicate that the drastic decline in the number of species recorded in a meadow following cutting may be reinforced when surrounding meadows are also cut. NB3 was cut late in 2005 and remained an 'island' of tall vegetation in a matrix of mown meadows. NB3 was characterised by the sole occurrence of *Aphantopus hyperantus* (on the left hand side of Figure 2) and not, as might be expected, by the additional occurrence of later flying *Melanargia galathea* and *Maniola jurtina* (both on the right hand side of Figure 2). The meadows of the SB transect also reflect this pattern with the exception of SB3 in which the nectar of a clump of *Telekia speciosa* attracted high numbers of *Inachis io*. Further research is needed to verify whether uncut meadows in a matrix of mown parcels support fewer butterfly species than uncut meadows which remain bordered by uncut parcels but the results of this research indicates that this is the case.

The majority of meadows sampled in this study were cut in mid to late July. However, the analyses of vegetation data suggests that cutting dates of a single meadow may vary year to year. As would be expected, the earliest cut meadows are more intensively managed and are mown twice. These are located on the lowest south west facing transect and are underrepresented in this study. Those cut after the mid to late July cutting period are less intensively managed and reasons for their late cut include one or more of the following: ownership by elderly households, those with a lower labour capacity, owners who live elsewhere and rent their land out and households for which these parcels are the last to be cut on the smallholding.

Determinants of meadow management

A number of factors, other than edaphic and climatic, determine when a meadow is cut in the study area. Smallholdings comprise several parcels of meadow of varying size but on average each parcel is less than 1.5 ha. The meadows of a smallholding are rarely contiguous in their location due to exchanges of land through inheritance, marriage or purchase. Each smallholding has at least one parcel that is managed for two cuts of hay per year and which receives higher levels of dung. These are generally the lowest in altitude and are cut first. Higher meadows, cut later and only once, are dunged less and used for grazing in the autumn. Although the intensity of a meadow's use generally decreases with increasing altitude and vice versa, this is not always the case. A household may have a parcel at a lower altitude that has the potential to be cut twice but because they have a 'better' parcel elsewhere, it may be managed for only one cut in contrast to the more intensively managed surrounding meadows.

A low labour capacity in a household may delay the speed at which hay can be made and for this reason it is also possible for a lower and potentially more productive meadow to be cut late. Where edaphic factors are similar, differences in the labour capacity of households and in the use of the constituent meadows of a smallholding can therefore cause two adjacent parcels of land to be managed at different intensities. The consequences of this can be observed in the study area by the distinct separation of different plant communities at the fence lines demarcating the boundaries of hay meadow ownership.

In Moeciu de Sus, there are several hundred individual parcels of meadow. The heterogeneity in plant communities in the landscape caused by subtle variations in the management intensity of relatively small parcels of land is therefore considerable and is highly deserving of further research. In addition to the heterogeneity between parcels, edaphic and management factors can cause within parcel variations in vegetation communities. Dung, for example, is spread manually on the hay meadows in the spring

having accumulated in the hay barn on the meadow where the livestock are kept for all or part of the winter. The physical effort required to carry heavy buckets of dung on steep slopes to all the parts of the meadow can limit the spreading of dung to the vicinity of the barn causing marked differences in vegetation composition and height within the meadow.

Cupido minimus is less affected by the mowing event than later emerging butterfly species. However, populations of this species may fluctuate from year to year probably caused by changes in the abundance of its host plant, *Anthyllis vulneraria* (Asher et al, 2001). Climatic factors are important in determining the seed production and seedling emergence in this species (Bastrenta, 1991). The establishment of the plant is favoured by sparse swards and is therefore disadvantaged by the deposition of cattle dung (Dai, 2000) as this causes a shift in vegetation to denser grass dominated swards. The meadow labelled AS2 is managed for two cuts of hay in the lower half of the parcel and for one cut of hay in the higher section. This higher section receives less dung and contains an abundance of *Anthyllis vulneraria* in contrast to the lower more heavily dunged section which contains only a few individuals of this species. In a heterogeneous landscape of small parcels of hay meadows managed at different intensities over a large spatial scale there will be sufficient patches of *Anthyllis vulneraria* to sustain metapopulations of *Cupido minimus*. If a meadow is more heavily dunged and the local population of *Cupido minimus* becomes extinct, populations of the butterfly will exist elsewhere in the landscape where conditions are more suitable. Individuals from these populations can disperse to colonise patches of *Anthyllis vulneraria* when suitable conditions for the establishment of this plant return. In the Moeciu de Sus landscape unmanaged rocky scrub habitats may provide source populations of *Cupido minimus* for the more ephemeral hay meadow environment.

As well as sustaining metapopulations, heterogeneity in semi-natural grasslands caused by low-intensity management practices (in combination with edaphic factors) can meet the contrasting ecological requirements of different species of plant and invertebrates.

For example, the meadow labelled NB4 is thoroughly dunged resulting in a uniform and tall sward in June. Comparatively few butterflies (both individuals and species) were recorded in this meadow but it was filled with *Trollius europaeas*, a species listed as rare on the Romanian Red List of vascular plants. In an adjacent meadow, which receives very little dung, the vegetation is low and dominated by *Nardus stricta* but also contains the Red Listed plant *Arnica montana*, the existence of which is significantly negatively correlated with increasing nutrient levels (Brinkmann, 2006). It is improbable that conservation management strategies could meet the contrasting interspecific and intraspecific ecological requirements of the range of plant and invertebrate species that are currently conserved by the idiosyncratic hay meadow management practices of smallholders. Neither is it likely that the conservation management of hay meadow habitats could be achieved at the scale that these habitats cover at the present time.

Implications for conservation measures

The decline in the number of autochthonous butterfly species with an increasing intensity of meadow management is a probable consequence of higher fertility promoting a combination of reduced plant diversity, enhanced vegetation growth rates and earlier cutting dates. Most smallholders manage only one of their meadows for two cuts of hay and, as already discussed, it is possible even at lower altitudes for parcels of land within a transect to be managed at a lower intensity (e.g. AS3, AS4 and AS6 on the AS transect). The current range of management which results in a mosaic of meadows managed at differing intensities and variation in mowing dates is therefore highly compatible with the conservation of butterflies. The amount of dung applied to a meadow in Moeciu de Sus is limited because the production system is more or less closed with few if any external inputs. The number of livestock kept is constrained by the amount of winter fodder that can be produced thus limiting the amount of dung that is produced. The plant species diversity of the most heavily dunged meadows will still be high in comparison to meadows fertilised with higher quantities of dung or with applications of slurry or chemical fertilisers in more open livestock production systems.

From the perspective of biodiversity conservation it is therefore imperative to prohibit increased levels of fertilisation for semi-natural grasslands entered into voluntary AEM agreements or subject to mandatory Natura 2000 site management restrictions.

However, the intensification of meadow management is a less probable scenario than the abandonment of hay making. AEM payments may in the short-term be welcomed by smallholders and could sustain HNV farming practices. In the medium to long-term, however, the support of specific land-use practices through AEMs is unlikely to maintain the functioning of semi-subsistent livestock production systems in the mountains of Romania (not least because the number of smallholdings that can be supported through the high nature value grassland AEM is nominal in comparison to the 800 000 or more smallholdings that currently utilise, at a low-intensity, more than a million hectares of semi-natural grasslands in the mountain areas of Romania alone).

At present in Moeciu de Sus, smallholders are dependent on professional shepherds to communally herd their livestock during the summer months, releasing the smallholding land and the labour of the household for the production of hay. The organisers of the communal summer grazing are reporting difficulty in engaging men skilled in the profession of shepherding as this is becoming less attractive as a livelihood now that opportunities for earning equivalent salaries for less arduous toil are becoming more frequent. This factor currently threatens the functioning of the livestock production in the village. In the long term it is also probable that the economic rationale for smallholding based and semi-subsistent production will diminish. The support of specific management practices, though important from a biodiversity conservation perspective will be futile if the functioning of low-intensity farming systems is not effectively supported and socially sustainable and if the abandonment of production is a more attractive choice.

Conclusions

The recording of 46 butterfly species on eight transects (over the course of two summers) illustrates the high species richness of the semi-natural and more natural grasslands (hay meadows, fallow meadows and rocky calcareous scrub) surrounding the village of Moeciu de Sus. These 46 species were recorded in the equivalent of 1.7 ha. A similarly high species richness of vascular plants has been described for the meadows of the village by Tok (1998). The high diversity of butterfly and plant species is maintained by the low-intensity of hay meadow management. An increase in the intensity of management will lead to a decline in the number of autochthonous butterfly species.

The abandonment of hay making will also cause a decline in both butterfly and plant species in hay meadow habitats. It will not be feasible to replicate the temporal and spatial heterogeneity caused by the subtle differences in the management of small parcels of land by conservation management. It is therefore imperative that rural development measures are implemented that secure the social and economic viability of pastoral production systems in Romania.

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Appendix A. Unidentified butterflies omitted from the analysis (1, 266 individuals)

	2005	2006
<i>Pieris brassicae</i> or <i>Artogeia rapae</i>	136	123
<i>Colias hyale</i> or <i>C. chrysotheme</i>	11	17
Unknown Lycaenidae (non blue)	0	2
Unknown blue	31	5
<i>Maculinea rebeli</i> or <i>M.alcon</i>	3	0
Unknown Nymphalidae	6	0
Unknown fritillary	46	1
<i>Clossiana euphrosyne</i> or <i>C. selene</i>	31	24
<i>Argynnis niobe</i> or <i>A. aglaga</i>	289	350
<i>Erebia aethiops</i> or <i>E. ligea</i>	21	23
<i>Coenonympha glycerion</i> or <i>C. pamphilus</i>	1	0
<i>Hesperia comma</i> , <i>Thymelicus sylvestris</i> or <i>T. lineola</i>	46	100
Total	621	645

Appendix B. List of species recorded in 2005 and 2006, 46 species in total. Ten species have been listed by van Swaay (2002) as being characteristic of calcareous grasslands. Three species are listed as vulnerable in the Red List of Romanian Butterflies as detailed in Schmitt and Rákósy (2007). Five are listed as near threatened, vulnerable and endangered in the Red Data book of European Butterflies (Rhopalocera) (Van Swaay and Warren, 1999). One species, *Maculinea rebeli* has been given a global threat status of vulnerable (Van Swaay and Warren, 1999).

Species	Classified as autochthonous (A) or highly mobile (HM)	Number of individuals recorded in		Regarded as characteristic of calcareous grasslands (Van Swaay, 2002)	Romanian Red List Status (Schmitt and Rákósy, 2007)	European status (Van Swaay and Warren, 1999)
		2005	2006			
<i>Pieris brassicae</i>	HM	7	6			
<i>Artogeia rapae</i>	HM	29	0			
<i>Anthocharis cardamines</i>	A	17	1			
<i>Gonepteryx rhamni</i>	HM	6	10			
<i>Leptidea sinapsis</i>	A	2	1			
<i>Callophrys rubi</i>	A	9	1			
<i>Lycaena phlaeas</i>	A	3	0	Yes		
<i>Lycaena alciphron</i>	A	7	4		Vulnerable	
<i>Lycaena vigaureae</i>	A	75	75			Near threatened
<i>Cupido minimus</i>	A	128	116	Yes		
<i>Maculinea rebeli</i>	A	10	0	Yes	Vulnerable	Global status: Vulnerable

<i>Maculinea arion</i>	A	2	12	Yes	Endangered
<i>Aricia agestis</i>	A	2	4		
<i>Cyaniris semiargus</i>	A	15	1		
<i>Plebicula dorlyas</i>	A	14	5	Yes	
<i>Polyommatus icarus</i>	A	18	12	Yes	
<i>Hamearis lucina</i>	A	3	1		Near threatened
<i>Apatura iris</i>	HM	0	1		
<i>Neptis rivularis</i>	A	1	2		
<i>Vanessa atalanta</i>	HM	4	13		
<i>Aglais urtica</i>	HM	34	46		
<i>Inachis io</i>	HM	77	81		
<i>Vanessa cardui</i>	HM	9	17		
<i>Argynnis paphia</i>	A	0	5		
<i>Argynnis aglaja</i>	A	70	106		
<i>Argynnis niobe</i>	A	48	24		
<i>Issoria lathonia</i>	HM	4	10		
<i>Clossiana dia</i>	A	0	7		
<i>Clossiana euphrosyne</i>	A	23	2		
<i>Clossiana selene</i>	A	8	20		
<i>Mellicta athalia</i>	A	56	39		
<i>Melanargia galathea</i>	A	172	277	Yes	
<i>Erebia ligea</i>	A	44	10		
<i>Erebia aethiops</i>	A	9	15		Near threatened
<i>Erebia medusa</i>	A	155	73		Vulnerable
<i>Maniola jurtina</i>	A	277	506		
<i>Aphantopus hyperantus</i>	A	528	612		
<i>Coenonympha pamphilus</i>	A	63	49	Yes	
<i>Coenonympha glycerion</i>	A	20	4		
<i>Lasiommata maera</i>	A	6	26		
<i>Pyrgus malvae</i>	A	10	0		
<i>Erynnis tages</i>	A	15	2	Yes	Vulnerable
<i>Thymelicus lineola</i>	A	0	4		
<i>Thymelicus sylvestris</i>	A	2	0		
<i>Hesperia comma</i>	A	24	22	Yes	
<i>Ochlodes venatus</i>	A	1	8		
Total		2007	2230		

Appendix C. Transect section descriptions including length, type, dominant soil type, management intensity and mowing dates for 2005 and 2006. Note that soils were not sampled and this description was made through observation only.

Transect	Transect and transect section length (m)	Section description	Dominant soil type	Management intensity	Date mown 2005	Date mown 2006
AS (Above School)	555					
AS1	84	Mown woodland ride	Calcareous	3	16/07	19/07
AS2	55	Meadow	Calcareous	7	09/07 lower section 16/07 upper section	29/06 lower section
AS3	70	Meadow	Calcareous	5	19/08	12/08
AS4	54	Meadow	Calcareous	7	15/08	Mid-July
AS5	61	Meadow	Calcareous	7	15/07	4/07
AS6	36	Meadow	Calcareous	6	12/08	28/07
AS7	64	Meadow	Calcareous	9	15/07	01/07
AS8	46	Meadow	Calcareous	8	25/06	08/07
AS9	85	Meadow	Calcareous	9	26/06 lower section 07/07 upper section	06/07
ASE (Above School Edge)	300					
ASEBB	167	Scrub and calcareous pavement	Calcareous	0	Not applicable	Not applicable
ASEAB	133	Ungrazed grassland with	Calcareous	0	Not applicable	Not applicable

Transect	Transect and transect section length (m)	Section description	Dominant soil type	Management intensity	Date mown 2005	Date mown 2006
		saplings				
ACO (Above Casa Orleanu)	410					
ACO1	52	Meadow	Acid	8	12/08	05/08
ACO2	40	Meadow	Acid	8	22/07	28/07
ACO3	107	Meadow	Acid	3	28/07	Left fallow
ACO4	79	Meadow	Acid	4	28/07	09/08
ACO5	132	Meadow	Acid	7	25/07	24/07
NB (North Bisericuta)	477					
NB1	105	Meadow	Acid	9	28/07	02/08
NB2	69	Meadow	Acid	8	22/07	25/07
NB3	202	Meadow	Acid	4	11/08 upper section only	Left fallow
NB4	101	Meadow	Acid	8	28/07	25/07
SB (South Bisericuta)	411					
SB1	68	Meadow	Acid	6	27/08	25/07
SB2	107	Meadow	Acid	3	End of August	Left fallow
SB3	120	Meadow	Calcareous	5	28/07	25/07
SB4	116	Meadow	Calcareous	6	22/07	Mid-July
F (Fundata)	517					
F1	82	Meadow	Acid	6	11/08	19/07
F2	130	Meadow	Acid	6	11/08	29/07
F3	120	Meadow	Acid	1	Left fallow	Left fallow
F4	122	Meadow	Calcareous	8	Early August	19/07
F5	63	Meadow	Calcareous	7	Mid July	24/07
FM (Fundata)	283					

Transect	Transect and transect section length (m)	Section description	Dominant soil type	Management intensity	Date mown 2005	Date mown 2006
<i>Maculinea</i> FMS	158	Scrub and calcareous pavement	Calcareous	0	Not applicable	Not applicable
FMHM	125	Meadow	Calcareous	6	? but from late July onwards	Late July
FP (Fundata Pasture) FPU	433 170	Meadow	Acid	1	Left fallow late July onwards	Left fallow
FPP	135	Pasture	Acid	2	Grazed in late July and August	Ungrazed in June, July and August in this year
FPD	104	Scrub and calcareous pavement	Calcareous	2	Ungrazed and unmown (too rocky)	Ungrazed and unmown (too rocky)
FPFS	24	Meadow	Calcareous	1	Left fallow	Left fallow

Appendix D. Butterfly data summary

Table 1. Explanation of the pooling of 2005 butterfly data. The table below details which sampling periods were included in each of the pooled categories (June, July and August). A sample period is defined as the time taken to walk each of the eight transects once. The variation in sampling period length reflects interruptions by poor weather.

June	July	August
Date range: 29 May-26 June Number of sample periods: 3	Date range: 7-30 July Number of sample periods: 3	11 August-1 September Number of sample periods: 2
Sampling periods 1 st : 29 May - 12 June 2 nd : 11-17 June 3 rd : 22-26 June	Sampling periods 4 th : 7-11 July 5 th : 18-26 July 6 th : 27-30 July	Sampling periods 7 th : 11-22 August 8 th : 25 August -1 Sept

Table 2. The total number of species and the number of autochthonous species recorded on each transect in June, July and August 2005 (as defined by the division of sampling periods - see Table 1 of this appendix).

Transect	Number of butterfly species recorded in June		Number of butterfly species recorded in July		Number of butterfly species recorded in August	
	Total	Autochthonous only	Total	Autochthonous only	Total	Autochthonous only
AS	11	10	10	7	11	10
ASE	11	9	17	12	13	12
ACO	7	6	15	10	6	2
NB	9	6	7	5	3	2
SB	8	7	14	11	9	5
F	12	12	17	14	11	6
FM	15	13	20	17	7	5
FP	10	10	15	13	9	7

Table 3. Total number of species and number of autochthonous species recorded in each pooled period, June, July and August in 2005

	June	July	August
Total	26	29	23
Autochthonous only	21	22	16

Table 4. Explanation of the pooling of 2006 butterfly data. The table below details which sampling periods were included in each of the pooled categories (June, July and August). A sample period is defined as the time taken to walk each of the eight transects once. The variation in sampling period length reflects interruptions by poor weather.

June	July	August
Date range: 21 June-6 July	Date range: 19 July-5 August	Date range: 9-21 August
Number of sample periods: 1 or 2*	Number of sample periods: 3	Number of sample periods: 2
Sampling periods 1 st : 21-26 June 2 nd : 26 June-6 July	Sampling periods 3 rd : 19-21 July 4 th : 23-27 July 5 th : 28 July-5 August	Sampling periods 6 th : 9-14 th August 7 th : 17-21 August

*weather conditions prevented sampling of the NB and SB transects in this sample period, therefore these two transects were repeated only 6 times in 2006.

Table 5. The total number of species and the number of autochthonous species recorded on each transect in June, July and August 2006 (as defined by the division of sampling periods - see Table 1 of this appendix).

Transect	Number of butterfly species recorded in June		Number of butterfly species recorded in July		Number of butterfly species recorded in August	
	Total	Autochthonous only	Total	Autochthonous only	Total	Autochthonous only
AS	7	6	14	10	8	7
ASE	12	10	16	12	14	11
ACO	6	5	16	12	8	8
NB	5	2	14	11	6	5
SB	5	2	15	10	10	6
F	12	11	14	11	7	7
FM	13	12	15	12	5	4
FP	15	11	21	16	9	7

Table 6. Total number of species and number of autochthonous species recorded in each pooled period, June, July and August in 2006

	June	July	August
All	24	31	22
Autochthonous only	20	23	16

**Paper 2. Smallholding based pastoralism in the Romanian Carpathians:
implications for agri-environment programmes directed at the
conservation of semi-natural grasslands**

Smallholding based pastoralism in the Romanian Carpathians: implications for agri-environment programmes directed at the conservation of semi-natural grasslands

Abstract

The development of agri-environment measures directed at the conservation of semi-natural grasslands is occurring in Romania in the absence of detailed information on the pastoral production systems that are currently sustaining these habitats and their associated species. The speed of the policy development process during the accession of Romania to the European Union in January 2007 and a general lack of resources for research have prevented the evaluation of proposed measures against examples of the pastoral systems that they will target. This paper uses a case study of a village in the Carpathian Mountains where the hay meadow management practices of smallholders maintain semi-natural grasslands of notable importance for biodiversity conservation. The practicability of implementing the proposed high nature value grassland conservation agri-environment measure is analysed in respect to the current organisation of the pastoral system and the management practices of both the smallholders and the shepherds that communally herd the livestock during the summer months.

The difficulty of hiring shepherds for the communal herding of livestock (men are leaving the profession for less arduous livelihoods) is one of the main factors that may jeopardise the functioning of the pastoral system in the short-term. Agri-environment measures will be insufficient to address problems related to the socio-economic viability of the production system and for this reason are unlikely to achieve semi-natural grassland conservation targets. This paper also highlights some of the cultural elements of pastoralism and land-ownership in the village with regards to the limited potential for associative action and, less pathologically, to the factors that may act as a brake on the abandonment of pastoralism.

Key words: pastoralism, smallholdings, shepherds, semi-natural grasslands, biodiversity conservation, common grazings, rural development, Romania.

Introduction

A loose definition of pastoralism is required given the variety of pastoral systems that exist in Europe, each adapted to the natural environment in which they occur. As a conceptual basis, however, pastoralism is a low-intensity form of livestock production and can be distinguished from intensive systems by low nutrient inputs and low outputs per hectare (Bignal and McCracken, 1996). Pastoral systems can also be characterised by a reliance upon semi-natural vegetation for forage and, in some cases, fodder.¹

The development of agriculture in Europe during the 20th century has resulted in the constraints of the natural environment being surmounted by inputs of financial capital, the implementation of technological innovations in machinery and agro-chemicals and the production of higher yielding crops and breeds of livestock. The rise in more intensive agricultural land-use practices and the decline in pastoralism has been mirrored by the loss of semi-natural grasslands following the conversion of pasture and meadow to arable land and intensively used grasslands, or merely, by the abandonment of land that cannot be used more intensively and the subsequent regeneration of forest. The loss of semi-natural grasslands has diminished the biodiversity of Europe, particularly species of plants and invertebrates that have adapted to these pasture and meadow habitats over several millennia of use (Beaufoy et al, 1994).

¹ The EU Concerted Action PASTORAL Project (QRLT-2000-00559) provides a useful definition: 'Pastoralism is characterised by the grazing of livestock at low densities in large 'unenclosed' areas overwhelmingly dominated by semi-natural vegetation. This semi-natural vegetation provides the vast majority of the livestock's forage requirements throughout the year. In some areas where animals are not herded or shepherded on a daily basis, there may be fences but in general such pastures and grazing areas are so large that they are not constantly restricting the animal movements or grazing behaviour' (www.sac.ac.uk/research/projects/featured/pastoral/).

Pastoralism is now limited in extent to the areas of Europe where the natural environment prevents the adoption (whether complete or partial) of modern land use practices and where socio-economic circumstances maintain a rationale for this economically marginal mode of livestock production. In the Romanian mountains semi-natural grasslands are being conserved because there remains a strong necessity for households to produce food for their own table as a consequence of the political circumstances of the last century. In these regions, the constraints of the natural environment (nutrient poor and thin soils and steep terrain) limited the potential for the intensification of agricultural production that occurred in the lowlands of the country between 1945 and 1989 (Sârbu et al, 2004). These natural constraints and the comparatively remote and sometimes dispersed mountain settlements hindered attempts by the communist government to collectivise these areas (Beck, 1976). In the lowlands, the brutal and coercive central planning policy of collectivisation abolished private land ownership rights in an attempt to 'push the peasants from their old way of life' (Kideckel, 1993). By nationalising agricultural land to form cooperative and state farms, the government restricted household based production with the intention of freeing up labour to create a 'peasant-worker' work force. By the 1960s, 60% of agricultural land 'belonged' to cooperative farms and 30% to state farms. Only ten percent of agricultural land, predominantly located in upland zones, remained in private ownership (Kideckel, 1993). In 1985, this amounted to 1.4 million hectares utilised by 2854 uncollectivised mountain villages (Rey, 1985). At this time, an average mountain smallholding comprised 2.4 ha of land, 1-2 cows, 3 sheep, 1 pig and 15 chickens (Rey, 1985).

Mountain communities escaped collectivisation but were forced to produce for the state. Severe quotas, later superseded by contracts, ensured that the majority of smallholding produce was taken by the government. These quotas also disproportionately disadvantaged larger properties and encouraged the persistence of small holding sizes. Upland communities were further disadvantaged by the nationalisation of forests in 1958 and the subsequent loss of resources of timber and fuel (Muica et al, 1999). Household members in mountain villages contributed to the

peasant-worker labour pool through employment in the state forestry and agricultural sectors or by travelling daily on extensive public transport networks to the nearest industrial centre. The income accrued through employment was used to meet shortfalls in the production quotas (Beck, 1976; Muica et al, 1999). The end of communist governance in 1989 and the concomitant loss of jobs in the state forestry, agricultural and industrial sectors increased the reliance of rural communities on subsistent and semi-subsistent food production.

Twenty years later, pastoralism remains the mainstay of rural communities in the mountain areas of Romania which form a third of the national territory and account for 22% (or 2.9 million ha) of the total agricultural area (Rey et al, 2001). Where opportunities for employment exist, income is generated 'off-smallholding' but is generally insufficient for most mountain households to relinquish semi-subsistent or peasant forms of livestock production. Nationally, 81.3% of all agricultural holdings keep more than 50% of their produce for home consumption². This figure is likely to be representative of the situation in the mountain regions where 85% (815 813) of households own agricultural land. The average size of a non-commercial holding in Romania in 2005 was 2.14 ha and it is probable that this figure is also applicable to mountain smallholdings. In 2001, upland livestock production systems accounted for 2.7 million sheep (Rey et al, 2001), approximately 30 % of the national flock at this time (Mertens, in press) and 934 000 cattle or 27 % of the national herd (Rey et al, 2001). The number of sheep in Romania has dramatically fallen from 16.5 million in 1989 (Drăgănescu, 1997) to 7.0 million in 2005 (Benoist and Marquer, 2007) following the loss of communist markets for wool. The greatest decline in sheep numbers occurred on the former cooperative farms located in the lowlands (Drăgănescu, 1997). This trend is likely to have been slower in the uncollectivised uplands where production remained on small peasant holdings (Drăgănescu, 1997). Though mountain holdings are small, they cumulatively utilise and maintain over a million hectares of semi-natural grasslands (Rey, 2001).

² Unless stated otherwise, cited statistics have been obtained from the March 2007 and July 2007 drafts of the National Rural Development Programme for Romania (2007-2013)

A decline in the number of livestock in the uplands has occurred and depopulation, particularly of the more remote mountain valleys, has resulted in the abandonment of pastures and meadows (Baur et al, 2006). The phenomenon of abandonment is threatening the exceptional flora and invertebrate fauna of semi-natural grassland pastures and meadows (Baur et al, 2006; Schmitt and Rákósy, 2007). Romania has a comparatively high diversity of species in Europe because of the variety of biogeographical zones and habitats that exist in the country but also because of the persistence of areas of low-intensity farming systems including pastoralism (Baur et al, 2006). Of the 184 butterfly species in Romania, 143 reproduce in hay meadow habitats and 156 in pasture. The abandonment of these pastoral habitats will lead to a complete loss of several butterfly taxa (Schmitt and Rákósy, 2007). Similarly, the intensification of semi-natural grassland use through fertilisation and mechanisation 'will have fatal consequences for almost all butterfly species of the habitats concerned' (Schmitt and Rákósy, 2007). These predictions are corroborated by research detailing the decline of butterflies in regions of Europe where the intensification and abandonment of pastoral land use practices has occurred (Balmer and Erhardt, 2000; Asher et al, 2001; van Swaay, 2002; Wallies de Vries et al, 2002; Stefanescu, 2005; Öckinger et al, 2006; Wenzel et al, 2006).

Agri-environment measures (AEMs) were implemented in EU countries during the 1990s under regulation 2078/92 in an attempt to stem the loss of biodiversity on farmland. Entry in to an AEM is voluntary and in return for financial payments, land managers are obliged to maintain or recreate specified habitats considered to be valuable for the conservation of biodiversity. Since the inception of AEMs, it has been argued by some ecologists and environmentalists that the conservation of biodiversity associated with agricultural habitats would be better achieved by switching the focus of agri-environment support away from the de-intensification of farmland to the maintenance of extant low-intensity and 'high nature value' (HNV) farming systems (Beaufoy et al, 1994; Bignal and McCracken, 1996; Tubbs, 1997; Bignal and McCracken, 2000). Further impetus to direct support towards low-intensity farming systems has come from the Convention on Biological Diversity following the commitment of signatories to halt losses of biodiversity by 2010. The

support of HNV farming systems will be critical to achieving this 2010 target in Europe, where a significant part of the continent's biodiversity is dependent upon the conservation of semi-natural grasslands by low-intensity farming practices (Beaufoy et al, 1994). At the fifth Environment for Europe Conference held in Kiev in 2003, European environment ministers committed themselves to supporting, using agri-environment and rural development measures, the ecological and economic viability of a substantial proportion of high nature value farmland by 2008 (EEA, 2004) and the preservation and development of 'high nature value' farming systems remains as a strategic guideline in the most recent rural development programme, covering the 2007-2013 period (2006/144/EC).

The concept of HNV³ farming and farmland is not yet well understood (Larkham, 2007). Nevertheless, it has become embedded in EU policy and has thus far proven to be a useful tool in directing attention towards farming systems that play a critical role in conserving biodiversity both within the Natura 2000 network (sites protected in Europe by the Habitat Directive (92/43/EEC)) and in the wider 'unprotected' European countryside. The challenge remains, however, to move from policy rhetoric to the effective support of HNV farming systems, many of which are often the most economically and socially marginal of all European agricultural systems. This challenge will be particularly difficult to achieve in the most recently acceded EU member states. In Romania, the economic rationale that currently underpins subsistent and semi-subsistent pastoralism (and which consequently results in the conservation of large areas of semi-natural grasslands) will diminish as the country's economy develops. The increasing availability of capital and emphasis on economic competitiveness in agricultural and rural development policies will lead towards the restructuring and modernisation of livestock production but over 90% of all holdings in Romania fall below the threshold of the economic size deemed practicable for restructuring (RMARD, March 2007). This statistic, combined with the limitations of intensifying production in mountain environments and the inevitable increase in

³ HNV farmland is most commonly defined as 'those areas in Europe where agriculture is a major (usually the dominant) land use and where that agriculture supports or is associated with either a high species and habitat diversity or the presence of species of European conservation concern or both' (Anderson et al, 2003)

livelihood opportunities that are more financially rewarding (and less physically arduous) will contrive to drive the already evident trend of the abandonment of pastoralism and the loss of semi-natural grasslands (Turnock, 2002). Conversely, the entry of Romania into the European Union will also provide opportunities to support pastoralism and the conservation of semi-natural grasslands. In the short-term, AEM payments may be a welcome contribution to the income of rural households.

The Romanian government has proposed to implement a specific HNV grassland AEM. This AEM will aim to conserve semi-natural grasslands by preventing an intensification of land management practices. However, the development of the AEM has occurred rapidly both preceding and since Romania's accession to the EU in January 2007. Insufficient time and resources have prevented the collation of data detailing HNV farming systems: the ecological relationships between specific land management practices and biodiversity and the socio-economic and cultural factors that make systems function, and conversely, which may lead to their abandonment. The development of a HNV AEM grassland measures in the absence of an evidence base risks the development of management requirements and eligibility criteria that may not be appropriate to the pastoral systems that they will target. It is important to ensure that AEM management requirements are practicable for smallholders and the shepherds that communally herd livestock during the summer months to encourage the uptake of the voluntary agreements. In the medium to long-term, however, semi-natural grasslands will only be conserved if rural development measures can be used to support the socio-economic viability of HNV pastoral systems.

This research uses a case study approach to examine a pastoral system in a Romanian mountain village where the land management practices of smallholders have been demonstrated to conserve high nature value meadow grasslands (using both European and Romania criteria) (Tok, 1998). The research took an interdisciplinary approach combining ecological and ethnographic methodologies. The ecological fieldwork was concentrated in the summers of 2004, 2005 and 2006. Ethnographic fieldwork was mainly concentrated throughout the whole of 2005 but opportunities

to interview villagers and undertake participant observation were also taken in the summers of 2004 and 2006.

Information on livestock production in the village was obtained through a combination of participant observation and semi-structured interviews. These two methodologies complement each other well, as shortfalls in data collected during semi-structured interviews can be captured during participant observation. Participant observation over long periods of time allowed a far deeper understanding of both tangible and more tacit contexts than would otherwise have been gained through interviews alone. Activities participated in included dung raking, hay making, the daily tending of livestock outside of the summer grazing period and the walking of cattle up to summer pastures in the nearby uplands.

Semi-structured interviews were sought with each of the smallholders owning the 30 meadows and one parcel of pasture in which ecological sampling was conducted. 20 interviews were completed with each lasting approximately an hour. The remaining 11 were either refused (in three cases) or the owners were deceased or had moved away from the village (in eight cases). Although the interview script was structured, the interview itself was semi-structured allowing the elucidation of information through a more conversational approach. The interview questions concentrated on understanding the structure and management of the smallholding (number, area and management of the meadows, number and type of livestock, destination of the products etc). Information on the communal herding element of the pastoral system was gained during participant observation which included visits to each of the four locally used upland pastures.

This paper firstly sets the context by describing the organisation and functioning of the pastoral system in Moeciu de Sus; the case study village. This is followed by an analysis of the practicability of implementing the proposed HNV grassland AEM in respect to both the current organisation and functioning of the pastoral system and to the land management practices of both the smallholders and the shepherds that communally herd the livestock during the summer months. The paper also highlights

some of the cultural elements of pastoralism and land-ownership in the village with regards to the potential for associative action and, less pathologically, to the factors that may act as a brake on the abandonment of pastoralism.

Case study: Moeciu de Sus

Moeciu de Sus (25° 19' 46.89"E, 45° 26' 41.83"N) is one of several villages that lie along the Bran-Rucăr corridor, a pass through the Carpathian Mountains that connects Transylvania in the north with Wallachia in the south. Flanking the west of the corridor, which is aligned along a north east to south west direction, is the Piatra Craiului massif and to the east are the Bucegi Mountains. The Bucegi Mountains are the most accessible mountains to city dwellers in both the county capital (Braşov) and to Bucharest and many of the villages lying along the Bran-Rucăr corridor, including Moeciu de Sus, have become popular holiday destinations. Despite the livelihood opportunities generated by tourism related activities, it is still a necessity for the majority of households in the village to combine paid employment with smallholding based food production. In this sense, livelihoods in Moeciu de Sus can be described as pluriactive and semi-subsistent.

Moeciu de Sus belongs to the Moeciu *comună* (parish) which also includes the villages of Moeciu de Jos (Lower Moeciu), Cheia, Drumul Carului, Peştera and Măgura. The total area of the *comună* amounts to 10 943 ha of which 4111 ha are classified as agricultural land (69% of the agricultural land is pasture and 26% meadows) and 1409 ha as worked forest (Tok, 1998). The 4 ha of orchard in the *comună* are located in the villages that are lower in altitude than Moeciu de Sus. The centre of the village is at a height of just under 1000 m and the hay meadows rise steeply up to approximately 1300 m. The steep slopes in Moeciu de Sus would have limited the potential to cultivate cereal crops but this was common in nearby villages on more gently sloping land (Praoveanu, 1998).

The population of the village stood at just under 1000 people in 2005 and the 232 households in the village cumulatively own approximately 700 ha of hay meadow. During the summer smallholders (the vast majority of households in the village own smallholdings) send livestock to four upland pastures less than a day's walk from the village where cattle and sheep are communally herded. Three of these (*Poiana Lacului*, *Clăbutcel de Sus* and *Clăbutcel de Jos*) are locally administered commons used exclusively by livestock from the village. The fourth (*Padină*) is leased by a local shepherd from a private land owner and takes livestock from other villages as well as from Moeciu de Sus. The number of livestock in Moeciu de Sus (circa 450 head of cattle and 2000 sheep) exceeds the capacity of these four pastures and approximately 100 cows and 1000 sheep are sent (by lorry in the case of cattle or by foot for sheep) to one of several, often privately owned and leased, pastures in the lowlands during the summer months. The communal herding of livestock on pastures during the summer months releases the smallholding land and labour for the production of the hay that sustains livestock during the cold continental winters.

The low-intensity management of the hay meadows, using only dung as a fertiliser, has resulted in semi-natural grassland plant associations that are listed as being of European Community interest under the Habitats Directive (mountain meadows - Natura 2000 code: 6520; acidophilous mountain *Nardus* pastures - Natura 2000 code: 6230; basiphilous active peats - Natura 2000 code: 7230) (Tok, 1998; Sârbu et al, 2004). Not only are these meadows of high nature value from a European perspective but they also harbour 12 species of plant listed as rare or vulnerable on the Romanian Red List of Vascular Plants (Tok, 1998, Sârbu et al, 2004) and three species of butterfly listed as vulnerable on the Romanian Red List of Butterflies (Schmitt and Rákossy, 2007). The location of the village between two candidate Natura 2000 sites (Bucegi Mountains and the Piatra Craiului massif) and the existence of high nature value hay meadow habitats and 'red list' species would suggest that Moeciu de Sus is highly suitable for inclusion within a delimited HNV grassland AEM area.

Organisation of the production system

Smallholdings

Smallholdings vary in their size according to the labour capacity of the household but are typically less than three hectares. The fragmented and fine-scaled mosaic of meadow tenure reflects exchanges of land through partible inheritance (the equal division of land between children), dowries and purchase. Traditionally, the youngest son of the household inherits the house, a strategy which may have once played a role in maintaining a favourable ratio of labour to land (Randall, 1976). Out-migration from the village is likely to have mitigated the potential of partible inheritance to diminish holding sizes.

The area of land owned is measured in the number of people it takes to scythe a meadow in one day, equating to three to four 'hay cutters' per hectare. The actual house and courtyard (in which it is not uncommon for three generations of a family to live) is located in the narrow valley floor. Most households have at least one parcel of meadow on the hill slope behind the house but the other parcels may be scattered about the surrounding hill slopes and can be as far as an hours walk away.

During the winter, livestock are stabled on barns situated on the individual meadows and in the spring the dung that has accumulated is spread on all or part of each meadow. The lowest, meadows receive higher levels of dung and are cut twice per year. The second cut, *otavă*, is prized for being more nutritious and is fed to cows and sheep at calving and lambing time to boost yields of milk. The higher meadows receive lower inputs of dung and are cut only once per year. The growth after the first cut of these meadows becomes an important grazing resource in the autumn.

Smallholders also cultivate one or more small vegetable plots, usually referred to as a garden or *grădină* and less often as a *holdă*, either in their courtyard or in a fenced-off section of a meadow. Turnips and beet are grown as fodder crops and in the past, potatoes have been grown for the table. The potato crop failed during the years that fieldwork was undertaken in the village most likely due to infestations of Colorado Beetle and in these years potatoes were purchased. Only the more affluent villagers

buy in maize meal (which forms the staple of the human diet) or wheat husks as a feed supplement for livestock.

Cattle herd sizes are very small, typically between two and four and sheep flock sizes, in non-shepherding households, are less than ten if any are kept at all. Sheep numbers may exceed 100 in the minority of households that specialise in sheep production. The sheep are mostly of the generalist *Țigăia* breed but professional shepherds may also own a number of the hardier *Țurcană* race which are a wool breed. Cattle are a mixture of breeds, including the *Brună* and the *Bălțata Românească*. Records of genealogy are not kept and the genetic stock of livestock is not actively selected by the smallholders as livestock are inseminated naturally during the communal herding on the summer pastures. The few cows that are home kept during the summer are artificially inseminated, a practice more common in a neighbouring village where many cattle are grazed daily during summer months on pastures amidst the settlement. Most households also store-keep pigs and these are fed on household scraps and killed in the days preceding Christmas. The slaughter of livestock by smallholders is still permitted despite fears that entry into the EU would result in the prohibition of the practice. Lambs and calves that are not kept as replacement stock are consumed within the household.

From the beginning of October to the end of May, the cattle remain in the care of their owners on the smallholdings. The bulk of the duty of their daily care often falls on the grandparents of the household but is shared between all of the adults and the older children as time allows. In the autumn cattle graze the regrowth of hay meadow vegetation until the first fall of snow after which time they are barn-kept along with any sheep for the duration of the winter. Livestock are moved from barn to barn on the different meadows of the smallholdings during the winter months to consume the hay produced in each meadow and to supply the dung that is necessary to fertilise the growth of hay. Sawdust from the local sawmills is used as bedding in the lower barns and pine needles collected from the forest litter are still used in more remote barns on the higher meadows.

During calving in March the cattle are brought to the barn closest to the household to facilitate the greater level of care needed at this time. From this time onwards, cows are milked twice daily with some of the milk being kept for consumption and the remainder being made into an unripened cheese called *caş*. Of 19 households asked whether they sold their products, three sold them outside of the village on an established commercial basis (directly at a market and to a 'middle-man'), one sold produce on the road-side at a popular tourist spot and 15 kept the majority of their produce for their own consumption which includes for use in their own tourist accommodation where relevant (both informal room letting and more formal guesthouses). Some of these 15 admitted to selling milk informally within the village in low quantities on an ad hoc basis. In 2006, 20 households (less than 10% of the households in the village) sold milk to the local collector (also based in the village and supplying a milk processing unit in Braşov) as few have sufficient surplus to warrant this and ad hoc sales generate higher prices per litre.

On June 1st, or thereabouts, it is the responsibility of the smallholder to walk their cattle up to the higher pastures in the vicinity of the village or to organise transportation by lorry to lowland pastures. The situation for sheep is somewhat different in that they are collected *en masse* by shepherds in April to be walked to the lowlands where they graze until late May. In June they join the cattle on the summer pastures but are also grazed on lowland arable stubbles from early October until the first fall of snow when they return to the village to be barn kept on the smallholding. June is then a period of relative quiet on the smallholding before the arduous task of hay making begins in earnest in July, moving upslope as the summer progresses and returning to the lower meadows for a second cut in September. Hay is cut by scythe by men, although there are women who are also skilled in this task in the village. When a household is short of labour, itinerant hay cutters, often from poorer parts of the country or from the Roma ethnic group, may be employed on a daily basis.

Village pastures

The communal herding of livestock on the higher pastures (and the production of cheese here on behalf of the smallholders) in the summer months is an efficient use

of land and labour, releasing smallholders to make hay on the lower more productive land and utilising the forage available on higher less productive grasslands. The three locally administered pastures are rented on an annual basis by individuals from a small pool of households specialising in professional shepherding and sheep production. However, in the last few years the lease of one pasture has been taken by a non-shepherd who is the village milk collector. To rent a pasture, applicants have to state how much they will charge smallholders in the form of a grazing tax per animal and how much cheese each livestock owner will receive in return for each litre of milk their livestock produce, as measured on a specific day in July. For example, 1 litre of milk may equate to 8kg of hard cheese (*brânză* – a matured version of *caş*) and 2 kg of soft cheese (*urdă*). If a cow produces 8 litres of milk on the day of measurement, the owner will therefore receive 64 kg of hard cheese and 16 kg of soft cheese for the duration of the grazing period (June 1st to October 1st) for that one animal. In the past the villagers would have travelled up to the pastures on this day to oversee the measuring but cite a lack of time for no longer doing so. There is a cheese specific to the Moeciu area which is *brânză* wrapped in pine bark. The collection of the pine bark is labour intensive and there is now a trend of storing the cheese in plastic. The income of the professional shepherds who lease the pastures comprises the money that remains from the grazing tax and the sale of surplus cheese, after the payment of hired shepherds

Voting at a public meeting in the village hall in March decides whether an applicant is successful in his application to rent one of the pastures. The tenure of each pasture can change from year to year should an application not be renewed or, less frequently, if an application is rejected by public vote. The latter circumstance may occur if the smallholders are displeased with the service they received in a previous year. This has occurred in the past when a pasture has been overstocked (disregarding local regulations). After the tenancies have been secured, the successful shepherd then employs further shepherds for the tasks of herding the livestock and producing the cheese. The smallholders attend a second meeting to sign their animals up to a specific pasture. In an attempt to lessen the competition for pasture spaces, a new rule was introduced ahead of the 2006 grazing season, limiting

the number of places to two cows each per household. However, this rule can be circumnavigated if two generations both owning livestock live in one household.

In a neighbouring village, smallholders recall a past obligation to contribute time to the management of the pastures (pulling weeds and saplings) grazed by their livestock. This practice is reported by villagers to have ceased as a consequence of mayoral candidates trying to increase their popularity in pre-electoral propaganda. Few people recall this obligation in Moeciu de Sus indicating that, if it was in place, it was either abandoned many years previously or that it was poorly enforced. At present, monitoring of the pastures is negligible as is the control of invasive weed and tree species. It is unlikely that shepherds would be able to devote sufficient time to a task which may once have involved the labour of many people.

Netting (1976, 1981 and 1990) describes a similarly 'egalitarian' and 'corporate' management of common pool resources of forestry, pasture and water existing in the 1970s in an alpine dairy production system in Switzerland. Those with rights to use the pasture also had the responsibility of its maintenance through the mandatory *Gemeinwerk* or communal work days. The condition of the pastures was monitored by the smallholders on their regular trips to check on the condition of their livestock and the measurement of milk quantities was overseen by an official and repeated throughout the summer. The enforcement of pasture regulations was the responsibility of an elected commission of cattle owners and there was also an annual meeting of all pasture users at which herders would be employed. People not obeying regulations would be fined and the close involvement in pasture management of all users would have acted as a control on the abuse of regulations. It is feasible that pastures were once similarly managed in Moeciu de Sus as suggested by the former presence of at least one *obște* in the village. This was a form of communal and corporate management that often applied to the management of forestry resources and encompassed grazing rights. This *obște* would have disintegrated following the nationalisation of forests in the 1950s and only the older villagers now recall its presence.

Practicability of the proposed HNV grassland AEM

There are a variety of pastoralist modes of production in the Romanian mountains (Rey, 1985; Drăgănescu, 1997; Voiciu-Vedia, 1998; Idu, 1999; Rey, 2001; Constantin, 2003). In some locations cattle may graze pastures in the midst of the village or, as in the case of Moeciu de Sus, a shortage of pasture requires the short-distance transhumance of livestock to pastures where they are communally herded. Long-distance transhumance of flocks was once undertaken from the summer pastures in the Bucegi Mountains to the plains in the south of Romania but this practice no longer occurs in this locality. Despite the variety in the organisation of pastoral systems in the Romanian uplands, an analysis of the of the functioning of the production of livestock in Moeciu de Sus reveals some potentially common implications for the implementation of HNV grassland AEM

Hay meadows

'Goodness of fit', the compatibility of AEM management prescriptions with farm management plans, has featured strongly in the reasons given by farmers for their entry into schemes (Wilson and Hart, 2001; Siebert et al, 2006). The management prescriptions of the proposed HNV grassland AEM are compatible with the current intensity of hay meadow management in Moeciu de Sus (see Table 1, Appendix). The HNV measure, unlike the basic grassland conservation measure, imposes a restriction on the application of chemical fertilisers and would therefore prevent the intensification of land entered into the AEM. However, it remains unclear as to whether a smallholder would be required to enter the whole holding or selected parcels.

In Moeciu de Sus, the negative experiences of applying nitrates as fertilisers to the land for a brief period in the 1980s would suggest that, in the short term at least, smallholders would not seek to use chemical fertilisers if they became affordable. The prohibition of chemical fertilisers is therefore unlikely to deter participation in

the HNV grassland AEM. Out of 18 smallholders in the village who answered the question 'would they use chemical fertilisers if they could afford to?' four answered maybe or yes. Out of this group, one individual explained that the development of chemical fertilisers has improved since the 1980s. Of those that said no, some asked why this would be necessary when dung works so well, 'we would spend money in vain'. It is conceivable that it would only take the positive experiences of a small minority to convince others of the benefits of adopting new management practices, particularly if more income could be gained by orientating the smallholdings towards commercial production.

The restriction of the first cut of hay until after July 1st in the HNV grassland AEM might prove more off-putting to potential scheme applicants if the entry of the entire smallholding is necessary. Plant species which set seed late benefit from later mowing and although not explicit in the AEM, this is probably the ecological principle underpinning this prescription. Similar mowing date restrictions were applied in an English AEM aimed at conserving hay meadows in the Pennine Dales Environmentally Sensitive Area (Smith and Jones, 1991). Farmers objected to the possibility of missing out on good weather in June and the chance to get 'insurance against subsequent bad weather'. Prevention of early cutting also limited the amount of aftermath grazing (the regrowth of vegetation after mowing) available. Smith and Jones (1991) analysed the phenology (periodicity) of a set of hay meadow plants occurring in the eligible meadows of the area and concluded that the date restriction was not relevant to several species and would only have the desired affect if the whole hay making period was delayed, a scenario that only occurred on the highest farms in the area. Of greater importance, ecologically, and a strategy that also delays cutting dates, is to restrict the use of fertiliser.

Even at the relatively high altitude of 1000 m, lower meadows in Moeciu de Sus may be cut before July 1st but the sequential cutting of a smallholding's meadows by altitude without fertilisation and mechanisation (therefore slowing the duration of the hay making process) will ensure that late seeding species will thrive in some locations. The existence of more than 200 smallholdings in the village, comprised of

several parcels of land all managed in subtly different ways (according to the labour capacity of the household and the topographical 'make-up' of the constituent parcels of a smallholding) results in a variety of habitats and the conservation of a wide range of species, some of which contrast in their phenologies and ecological requirements. If this small-scale heterogeneity could be maintained over large extents of meadow habitat, the prohibition of higher levels of fertilisation alone would be sufficient to maintain a high diversity of species in the absence of cutting date prescriptions. Where it cannot be maintained, cutting date prescriptions need to be tailored to localised circumstances to avoid deterring the voluntary uptake of AEMs.

It would be ideal to incorporate sufficient flexibility within AEM to adapt management prescriptions to the specificities of different pastoral systems and the natural environment in which they occur (Baumgärtner and Hartmann, 2000; Dolek and Geyer 2002). In the case of pastures for example, different HNV grassland communities can withstand different grazing intensities and durations. At present, the grazing stipulation of both the grassland AEMs focuses on preventing undergrazing. Incorporating flexibility into the design of measures is primarily constrained in Romania by the need to monitor compliance with management prescriptions, a formidable task as eligible parcels of land may be as small as 0.3 hectares (personal comments: Didicescu and Redman). Compounding this is the lack of national and regional capacity and financial resources that would be needed to tailor measures to specific systems.

Nevertheless, management prescriptions with the purpose of conserving biodiversity should be based on sound and clearly explained ecological principles, particularly if they will cause a departure from established management practices. As Deuffic and Candau (2006) suggest, 'scientists and experts are sometimes hesitant as to the relevance of their agri-environment schemes, their knowledge and power can be ignored much more easily if their ideas do not work'. It may be that restricting cutting dates, at least in comparable situations to Moeciu de Sus, is not sufficiently ecologically justifiable to risk dissuading participation in a scheme, when from a

grassland conservation perspective, an early cut meadow is better than a meadow not entered into a scheme at all.

Communal herding on commons and private pastures

The basic grassland AEM and HNV grassland AEM require applicants to enter land into five year agreements. This length of period will be feasible for smallholding land as this is privately owned. In Moeciu de Sus, many smallholders do not have title deeds for every parcel of land that they own as land registry records were not updated during the communist period. In anticipation of this, applicants need only provide proof of use not proof of ownership. However, the five year stipulation may prevent the entry of commons into the grassland AEMs in Moeciu de Sus as this is a departure from the current length of tenure of one year. The proposed Less Favoured Area (LFA) rural development measure for mountain areas contains the stipulation that the 'financial support granted for common land used by more farmers as pasture could be granted to each farmer pending on the legal right to use the land or could be granted to farmers representatives' but no clarification is given for the agri-environment measures. The former option might be feasible in villages where cattle are grazed daily on commons that are located within the village. However, there is insufficient clarification to determine whether commons leased on an annual basis by individuals would be excluded from both the LFA and AEM measures.

The ability of smallholders to annually determine, by vote, which shepherd rents which common provides them with some leverage if they become dissatisfied with the care of their stock, the management of the pasture or the quality of the cheese produced. It may also act to ensure that the grazing taxes charged by the shepherds remain competitive. Furthermore, unless regulations are in place and enforced to ensure that the places for smallholder's livestock are guaranteed, a more secure tenure might encourage shepherds to increase their own herd sizes and the profitability of their private enterprise. This could result in the 'de facto privatisation' of common land and privately owned pastures also used for communal herding (see

McKenna et al, 2007 and Myrvang Brown, 2007). This trend might eventually arise in response to or in parallel with the abandonment of smallholding based production. In the short term, safeguards need to be in place to prevent places for the livestock of smallholders being squeezed out.

Socio-economic constraints on system functioning: hired shepherding

In Moeciu de Sus, the production of the 'high nature value' hay is enabled by the removal of livestock from the smallholdings during the summer. Shepherds are employed to communally herd livestock and produce cheese at this time. The shepherd that secures the tenure of a pasture is responsible for the hiring of the six or more other shepherds that are assigned the various tasks of herding the sheep (often divided into sub-flocks of milking ewes, the non-productive young stock and the rams), guarding the cattle and the production of cheese. The shepherds that secure the lease of pastures report the increasing difficulty of hiring men who are sufficiently skilled. They have resorted to employing unskilled men who have been unable find any other employment or who are from poorer regions of Romania. In turn, skilled Romanian shepherds can now find better paid work and working conditions in, for example, Italy. The difficulty of obtaining skilled labour was felt by one lease-holding shepherd to be *the* factor that will decide the future of the pastoral system. Men without a background in shepherding are less able to proficiently tend to the stock and often fail to maintain vigilance over the cattle and sheep during the night, increasing the chances of predation by bears and wolves. It is common practice that hired shepherds are allowed to mix their own stock in with the cattle and sheep belonging to the lease-holding shepherd and the smallholders without having to pay grazing taxes on these animals (personal comments, Mertens). In this way, they have more of an incentive to take good care of the flock or herd as whole but unskilled men often have no stock of their own.

It is unsurprising that fewer men are willing to work as shepherds and are instead attracted to less demanding employment or more economically rewarding shepherding work outside of Romania. The livelihood is extremely arduous

involving exceptionally long hours, rudimentary sleeping shelters if any and relatively low salaries. Decreasing the amount of labour needed for communal herding is not an option on pastures that are several hours distant from the village and only accessible on foot over steep terrain. Shepherds are needed to prevent predation from large carnivores and because the system is orientated towards dairy production necessitating several milkings per day and the continuous production of cheese. Increasing the salary of shepherds by raising grazing taxes might undermine the economic rationality of working a smallholding and would not address the issue of the comparatively arduous working conditions. In the long term, solutions need to be found to make shepherding a more attractive and economically viable livelihood if this livelihood is to continue. Payments made to smallholders to maintain their HNV meadows could be spent in vain if the communal pasturing element of the system becomes untenable.

Cultural constraints

At first glance the communal herding of the village livestock may be seen to represent a high level of cooperative action amongst villagers in Moeciu de Sus but in reality, examples of cooperative action outside of family networks (including the strong ties between godparents and godchildren) are few. Neither smallholders nor shepherds in Moeciu de Sus belong to an association and the capacity to feed back into the policy development process or more local administrative changes is very limited. The need for a representative association is not recognised as being of relevance by smallholders whose attitudes towards the implementation of policies that will affect their smallholding can appear almost fatalistic. Villagers may recognise that their way of production may be threatened, particularly in terms of the hygiene elements of the cheese production process on the summer pastures, but see the changes as being outside of their control.

Memories of the coercive socialist land use policies that were meted out on rural communities in the last century are still at the forefront of many people's minds and

can be argued to be at the core of the resistance to cooperative action (Muica and Turnock, 2000). In Moeciu de Sus, a lack of trust is given as a reason for not forming the small producer groups that could access certain rural development support measures. In contrast, however, the fact that nearly every household in the village manages a smallholding is a cohesive force in the sense that everybody is 'in the same boat'. The pastoral year provides occasions when people come together, during the annual transhumance up to the village pastures or in assisting family members with hay making. These occasions are much enjoyed by the villagers and are often imbued with a strong sense of camaraderie.

Compounding the lack of a strong 'civil society' amongst groups of smallholders and shepherds is the ineffectual trickle down of policy and administrative information to the household level. Information is largely gleaned in an uncoordinated form from the television or by word of mouth, passed on through individuals working in the local administration. The notification of mandatory vaccination of livestock in the spring, for example, is posted on the church door. Leaflets were produced by the government detailing the impacts of new EU legislation on smallholding based production but these were not distributed door to door, remaining in piles in the offices of the village administration. Most adults use mobile phones, including older family members and shepherds (when they have the opportunity to charge their batteries) and text messages could aid the dissemination of information through voluntary subscription services. In 2006, sponsorship from a mobile communications company resulted in the installation of the internet in the village hall. This is predominantly used by children and few adults are, at present, computer literate. The development of an exclusively online application process for rural development measures would therefore be inappropriate in the short term.

Cultural opportunities

The distrust of cooperative action may prove difficult to surmount but there are cultural factors that might be capitalised upon to increase the uptake of voluntary

AEMs. It is a matter of pride in Moeciu de Sus to be seen to be managing your hay meadows and livestock well. The term for smallholder, *gospodar* (masculine) and *gospodină* (feminine), can be used as a compliment to describe someone who is a good manager. This is corroborated by Kideckel (1993) who asserts that 'Labour was the major source of regional identity and the prime criterion of respect' and 'all households, regardless of wealth, were respected as long as their members worked hard, cared for their land and resources, and were honest and forthright in economic and social relations'. At present in Moeciu de Sus, this cultural attitude still pervades, and it is common to hear a person without paid employment refer to their smallholding as their job, often with pride.

This is not, of course, the only attitude towards smallholding work and others may explain that they have little choice other than to toil away. When a villager is asked what their profession is, they may say smallholder even when they have paid employment. This identity is seen by the smallholders as clearly distinct from that of a farmer, a term that applies to the owners of larger holdings who produce for the market. In this sense, a smallholder's identity is not tied up per se in the yields of hay, milk or cheese that they are producing. It is intertwined with the good management of resources and to a certain extent, self sufficiency and the survival of the household. In this respect, they would not need to make, the often difficult, shift from a 'productivist' to 'post-productivist' mentality as has been described for farmers entering into AEMs in western Europe (Wilson and Hart, 2001; Burton, 2004).

The symbolic importance, in some cases, of smallholdings as the constant in the lives of villagers, also engenders notions of stewardship. Land must be kept and passed on in good condition to the next generation. Smallholders who intimate this relationship with their meadows are those most unlikely to cash-in on the steep rise in land prices caused by the growth of tourism in the area. Notions of stewardship, both for the present and the future, might be harnessed in the promotion of AEMs. Though the core value of a smallholding is to provide sustenance for a family, taking good care of land could be equated, with care, to the importance of this type of production for

conserving both the cultural and natural heritage of Romania. Raising awareness of the cultural and natural heritage conserved by pastoralism, both amongst the pastoralists themselves and the wider population of Romania could help to maintain a sense of pride and worth of smallholding and herding practices. More instrumentally, it may act to engender greater acceptance of AEM management prescriptions, and mandatory Natura 2000 land-use restrictions.

At present, being a smallholder, or shepherd, is the norm in the village. These self-identities are generally robust even when villagers are closely exposed to tourists of far greater wealth and leisure time than their own. It is not uncommon for smallholders or shepherds to report with great derisive humour, the often derogatory comments made by visitors from urban areas. However, it is difficult to imagine that this robustness will remain should the majority of people abandon pastoralism. This indicates the need for raising the profile and status of this type of production in respect to the gamut of reasons why the socio-economic viability of pastoral systems should be supported (agricultural, social, cultural and ecological). In this respect, 'pastoralism' and 'pastoral' could be useful labels in distinguishing between production systems that provide little other than the industrial production of food, often to the detriment of the quality of products and the natural environment.

Conclusions

The conservation of semi-natural grasslands in Romania is dependent upon the continuation of pastoral modes of production. These habitats cannot be effectively (from an ecological and financial perspective) conserved in the absence of low-intensity hay making and pasturing. The proposed HNV grassland AEM is likely to encourage uptake by smallholders as it will not entail a significant departure from current management practices in the short term as long as the application process can be easily navigated. Nevertheless, it is important that the ecological principle underpinning specific management prescriptions is adequately justified and clearly explained to people entering their land into AEMs. At present, the proposed

management prescriptions dictating the grazing duration and timing hay cut may be sufficiently widely set to not greatly impinge on current land-use practices. Although this may not be the optimum approach from an ecological perspective, the most critical factor in conserving semi-natural grasslands will be the maintenance of low-intensity pastoral systems and securing the maximum uptake of AEM agreements. In light of this, it is imperative that AEMs are evaluated to ensure that stipulations such as the length of tenure do not act to exclude, for example, the users of commons from being eligible to receive payments.

In the short term, the economic situation in Romania will maintain the pressure for people to continue to produce food for their own table. Extents of semi-natural grasslands will continue to be conserved, whether or not they are entered into an AEM agreement. In the medium and long term, AEMs will be insufficient to maintain the social and economic viability of pastoralism and unless this is addressed, pastoral livelihoods will not be attractive to current and future generations. Finding ways to support the social and economic viability of HNV pastoral systems will be a hugely difficult task. This research has demonstrated the importance of starting with an analysis of the functioning and organisation of pastoral systems to ensure that the rural development measures that will be used to 'preserve and develop' HNV farming systems have the greatest chance of success.

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Appendix. A comparison of the proposed grassland AEM prescriptions with actual management practices

Table 1. A comparison of the proposed grassland AEM management prescriptions (taken from the draft National Rural Development Plan, July 2007 version) with the current land-use practices of the pastoral system in Moeciu de Sus.

	Package 2.1: Basic grassland conservation	Package 2.2: Conservation of HNV grasslands	Current management practices in Moeciu de Sus
Fertilisation	Chemical fertilisers allowed up to 40kg N a.s./hectare on meadows and pastures under commitment.	Complete ban on using chemical fertilisers and pesticides on meadows and pastures under commitment. Invasive weeds shall be removed by manual practices (e.g. repeated cuts in the affected spot area).	None used
	Use of farm yard manure is allowed up to a maximum equivalent to 60 kg of N a.s./hectare (will be expressed in terms of quantity of manure in the sub-measure guides to ensure an easy understanding for the farmers). High nitrogen manures (pig and poultry wastes) are not allowed for application on the parcels under commitment.	Use of farm yard manure is allowed up to a maximum equivalent to 60 kg of N a.s./hectare (will be expressed in terms of quantity of manure in the sub-measure guides to ensure an easy understanding for the farmers). High nitrogen manures (pig and poultry wastes) are not allowed for application on the parcels under commitment.	Figures for the quantities of dung applied (and N content) to meadows in Moeciu de Sus are not available. However, there is rarely sufficient dung to fertilise an entire meadow each year.
Pesticides	Pesticides can be used on meadows and pastures under commitment for control of invasive herbs, but only for local application (spot spraying using only backpack on the spots where invasive herbs occur).		None used
Grazing intensity	In case of pastures, the farmer will have to ensure	In case of pastures, the farmer will have to	Sufficient livestock numbers at present to

and duration	that the parcels under commitment are properly grazed, therefore as a management requirement – undergrazing should be avoided. In order to achieve this requirement, the sward height during August should not be higher than 20cm.	ensure that the parcels under commitment are properly grazed, therefore as a management requirement – undergrazing should be avoided. In order to achieve this requirement, the sward height during August should not be higher than 20cm.	ensure that this criterion is met.
	Grazing activity is allowed from March (provided bare soil <25%) until November.	Grazing activity can be performed from early April up to November.	The grazing period of the upland pastures used by villages is June 1 st to October 1 st .
Mowing frequency and timing	In case of meadows and meadow/pasture mosaics, at least one cut should be performed as a minimum.	In case of meadows and meadow/pasture mosaics, at least one cut should be performed as a minimum.	Only relevant to meadows entered into AEM. At present, some meadows may not be cut every year. Ecologists have highlighted the importance of fallows for butterflies (Erhardt, 1985; Balmer and Erhardt, 2000; Baur et al, 2006)
	A maximum of 3 mechanised cuts are allowed on the parcels under commitment. There is no such limitation for manual mowing.	A maximum of 2 mechanised cuts allowed. There is no such limitation for manual mowing.	No mechanisation in Moeciu de Sus.
		In the case of mechanised mowing, the mowing method should be concentric (should not be from the outskirts to the middle of the parcel).	Not applicable.
	Mowing activity can start only after 15 th June. The first mowing should take place no later than 15 th of August.	Mowing activity can start only after 1 st July. The first mowing should take place no later than 15 th August.	Mowing generally begins after July 1 st but on the lowest meadows can begin before this date. Note that Moeciu de Sus is comparatively high at 1000-1300 metres and mowing may begin in

		June in lower mountain villages.
Mowed grass has to be gathered from the surface no later than 2 weeks from mowing.	Mowed grass has to be gathered from the surface no later than 2 weeks from mowing.	This criterion is met.
Flooded pastures will not be grazed sooner than 2 weeks from the water's retreat.	Flooded pastures will not be grazed sooner than 2 weeks from the water's retreat.	Not applicable.
Valuable landscape and biodiversity elements will be maintained on the grasslands under commitment (trees; groups of trees).	Valuable landscape and biodiversity elements will be maintained on the grasslands under commitment (trees; groups of trees).	Criterion is too vague to evaluate.
Streams will be buffered by no prolonged grazing within 3 m to maintain woody vegetation and to prevent erosion although necessary watering of animals is allowed.	Streams will be buffered by no prolonged grazing within 3 m to maintain woody vegetation and to prevent erosion although necessary watering of animals is allowed.	Irrelevant to hay meadows where duration of grazing is restricted. Situation on upland pastures unknown.
No feeding of concentrates on field site (a list of concentrates will be provided to farmers within the application guides).	No feeding of concentrates on field site (a list of concentrates will be provided to farmers within the application guides).	None used.
Ban on ploughing the meadows and pastures under commitment.	Ban on ploughing the meadows and pastures under commitment.	Not applicable.
Ban on mechanised rolling of the meadows and pastures under commitment. Traditional horse drawn methods are allowed.	Ban on mechanised rolling of the meadows and pastures under commitment. Traditional horse drawn methods are allowed.	Not applicable.
No top-sowing or seed drilling to take place.	No top-sowing or seed drilling to take place.	Not applicable.

Discussion

Overview

Section 1 of this discussion examines the relationship between the hay meadow management practices of smallholders and butterfly species in Moeciu de Sus before emphasising that the conservation of semi-natural grasslands and their associated species in Romania can only be effectively achieved by the continuation of low-intensity pastoral practices. Section 2 examines the conceptualisation of pastoralism in Europe and suggests that 'pastoral', as a label, can be useful in distinguishing between livestock production systems that do and do not play a role in conserving biodiversity. Section 3 examines the potential of the land management measures of the 2007-2013 rural development programme to maintain the functioning of the pastoral system in Moeciu de Sus. Section 4 highlights some possible cultural obstacles (and opportunities) to the effective implementation of these measures and the summary reemphasises the need to direct appropriate support to the social and economic viability of pastoral systems to achieve the conservation of semi-natural grasslands in Romania.

Section 1. The role of pastoralism in conserving biodiversity

This research has demonstrated the importance of low-intensity pastoral land-use practices for the conservation of butterfly species in subalpine hay meadow habitats. A total of 46 species (Rhopalocera) and 4, 237 individuals were recorded on eight linear transects in the surroundings of the village of Moeciu de Sus during the course of two summers. The total area of the transect section equates to an area of 1.7 ha of semi-natural and more natural grassland habitat (70% meadows, 7% lightly grazed pasture and 23% unmanaged grassland including recently abandoned hay meadows, and rocky calcareous scrub). A comparable investigation in northern Romania recorded 68 species of diurnal Lepidoptera in subalpine meadows and abandoned meadows however included in this list are species of moth (Heterocera) (Baur et al, 2006). Three species, *Lycaena alciphron*, *Maculinea rebeli* and *Erynnis tages*, recorded in this research are

listed as having a vulnerable status in Romania (Schmitt and Rákósy, 2007). Five species recorded on the transects are listed in the Red Data book of European Butterflies (Rhopalocera) (Van Swaay and Warren, 1999): *Lycaena vigaureae*, *Hamearis lucina* and *Erebia aethiops* (all 'near threatened'), *Erebia medusa* ('vulnerable') and *Maculinea arion* ('endangered'). *Maculinea rebeli* is the only species that is given a global threat status ('vulnerable') (see Appendix B of the first paper in this thesis).

Butterflies are sensitive indicators of the state of semi-natural grasslands (Erhardt, 1985; Wenzel et al, 2006; Öckinger, et al 2006) and the results of this research suggest that the hay meadows of the village support a considerable diversity of plant species. This supposition is corroborated by an evaluation of the vegetation of the village hay meadows by Tok (1998) using the Braun-Blanquet methodology. Eleven different plant communities in five vegetation classes were identified with a maximum diversity of 66 species m² (ibid). Twelve plant species recorded in the meadows of Moeciu de Sus are listed as rare or vulnerable on the Romanian Red List for Vascular Plants (ibid, Sârbu et al, 2004).

In Moeciu de Sus, the idiosyncratic management practices of smallholders results in a degree of heterogeneity in meadow vegetation heights over the course of the summer. The reasons that determine the subtle differences in the management of meadows relate to both the topography of the individual meadows comprising a smallholding and the labour capacity of the household. The meadows of a smallholding are rarely contiguous in their location but are scattered on the steep hill slopes that rise up from the valley floor. These fragmented patterns of land ownership are, to a large extent, determined by exchanges of land through partible inheritance (land is divided equally between all children) and marriage. Parcels may also be bought and sold, particularly if a household comes to own a parcel that is situated too far away. Most households have a meadow that is located on a lower slope, often in proximity to the house, which is cultivated for two crops of hay per year and receives a higher level of dung than meadows cut once per year and generally located on higher slopes. As would be expected, the lowest meadow

is cut first and the rest in sequence with increasing altitude. Anomalies in this pattern may occur when a household owns meadows of a similar altitude in different locations. In this situation it is possible for meadows that could be cut earlier remaining uncut on a section of hill slope on which hay has already been made. A low labour capacity may also delay the date that a meadow is cut.

The reasons for differences in the dates of mowing can be illustrated using the butterfly transect labelled AS which passed through nine meadows (altitude of 1040m-1058m). In 2005, the first meadow (AS8) was mown on June 25th and the last to be cut was mown on August 19th (AS3). AS3 is owned by an elderly widow who is childless and who is reliant on her nephew to scythe both of her two meadows. AS3 is cut only once per year and is used for grazing in the autumn. The owner's other meadow is cut twice per year and receives a higher input of dung and is cut first. The nephew has many other demands on his time and even the twice cut meadow is cut late in comparison to the surrounding parcels of land. The owner dries and stores the hay with no other help and the second meadow cannot be cut until this process is complete. AS4 was also cut late, on August 15th. The owner of this meadow leaves his two cows and one donkey to graze the parcel until June 1st when they are taken up to the summer pastures. Stock are removed from neighbouring parcels in May to allow the hay grow. However, the owner of AS4 also has a small household of only two adults and owns only two meadows. The other meadow is mown twice as it is lower in altitude and is less rocky than AS4 which is of more use as a grazing resource in the spring and autumn and is only cut once. In contrast, AS5 was cut on July 15th. This meadow is cut twice and is small at less than a hectare in size and so the dung that accumulates when the cattle are overwintered in the barn is enough to fertilise the entirety of this meadow every year. Most meadows are manured on a rotational basis as there is insufficient manure to cover the whole meadow in any one year. By mid-June, the difference in the management of AS4 and AS5 is strikingly visible at the fence line that demarcates the boundary. On the AS5 side is a tall dense grass species dominated sward and the vegetation in AS4 is tussocky with many patches of bare earth caused by hoof prints and a high incidence of *Anthyllis vulneraria*.

The management of AS2 causes a distinct contrast in vegetation swards within the meadow. The path that traverses through this meadow is used by the owners to delimit the area which is more heavily dunged and mown twice (below the path and in closer proximity to the barn, cut July 9th in 2005) and the area above the path which receives less dung and is only cut later (in this year on July 16th but in 2006, nearly a month later). Before mowing, the lower half of the meadow is characterised by a denser sward and the frequent occurrence of *Trifolium pratense* indicating an intermediate level of fertility (Hill et al, 1999). In contrast, the sward above the path is sparser and is characterised by the widespread occurrence of *Anthyllis vulneraria*, a species that, as a weak competitor, is typically found in sparse swards where nutrient levels are low (Dai, 2000). These examples demonstrate the potential of topographical characteristics and labour capacity to cause differences in land-use practices that result in a heterogeneity in vegetation height and composition, both between parcels and within an individual meadow.

The ordination of butterfly data in 2005 illustrates the importance of later cut meadows, parcels of fallow and unmanaged calcareous grasslands for species of butterflies that fly predominantly in July and August (e.g. ringlet *Aphantopus hyperantus*, dark green fritillary *Argynnis aglaga*, niobe fritillary *Argynnis niobe*, meadow brown *Maniola jurtina* and marbled white *Melanargia galathea*). The analyses indicate that there is sufficient habitat to support later flying butterfly species despite the relatively ephemeral nature of the hay meadow habitat in late summer. Further research is needed to ascertain the use of late cut meadows, fallows and unmanaged grasslands by adult butterflies as feeding and breeding habitats. This could ascertain whether butterflies use patches of unmown vegetation that are isolated within a matrix of mown meadows.

In reference to the conservation management of calcareous grasslands in western Europe, Wallies de Vries et al (2002) state that 'spatial heterogeneity is a prerequisite for the maintenance of species'. Heterogeneity in habitats is important for meeting the

intraspecific and interspecific requirements of species and in ensuring the functioning of metapopulations. A single species of butterfly may utilise different resources as an adult. Female heath fritillaries (*Mellicta athalia*) have been recorded, in subalpine semi-natural grasslands in Switzerland, flying between abandoned meadows and managed meadows (Schwarzwalder et al, 1997). The occurrence of larvae on the larval host plant (*Plantago lanceolata*) in managed meadows and early fallows confirmed the use of these habitats for breeding whilst the more mature fallows were used as feeding habitats (ibid). Similarly, the silver spotted skipper, *Hesperia comma* requires the presence of the larval host plant, *Festuca ovina*, in short sparse calcareous swards (Davies et al, 2005) but feeds in taller swards containing nectar plants.

Weather conditions may also require species to alter their use of a habitat. *Plebejus argus*, the silver-studded blue, has been recorded in sunny conditions using open calcareous heathland, in which the larval host plants are concentrated, but moves to shrubs for shelter, roosting and resting when the weather is cooler (Dennis and Sparks, 2006). These examples of the contrasting intraspecific requirements of a single species intimate the level of heterogeneity in a habitat that is necessary to support a range of species. For example, even two closely related species of Satyrid butterflies (the meadow brown and gatekeeper (*Pyronia tithonus*)) with overlapping flight periods display many differences in their use of vegetation (Dennis, 2004). A habitat may also be used at different times of the summer by different species. In Moeciu de Sus, the monophagous small blue (*Cupido minimus*) can be recorded in a meadow in June, the polyphagous ringlet in July and the monophagous silver-spotted skipper in August. An inventory of all the invertebrate and plant species in a single meadow over the course of one summer would reveal an exceptional diversity of species many of which would vary in their ecological requirements. An audit of an adjacent meadow, particularly if managed differently, may reveal the presence of further species still. This spatial and temporal diversity of species is maintained by the heterogeneity introduced into the landscape by the subtle differences in hay meadow management.

The mowing event introduces a high level of disturbance into an individual parcel of meadow and whilst adults can escape, eggs and larvae may suffer mortality (Di Giulio, 2001; Johst et al, 2006). This reinforces the importance of spatial and temporal heterogeneity in large areas of semi-natural grassland habitats in supporting populations of species. Where habitats occur over large areas, species which exist in metapopulations can counter local extinctions by the dispersal and colonisation of individuals from local populations located elsewhere (New et al, 1995; Tschamtkke and Brandl, 2004). In Moeciu de Sus, 232 smallholdings utilise 700 ha of hay meadows. This equates to a minimum of 464 separately managed parcels as each smallholding comprises at least two meadows. The exact number of hay meadows parcels in the village may well be higher. It is improbable that conservation management could replicate the fine-scaled heterogeneity introduced into the environment by low-intensity hay production practices at an equivalent spatial scale.

Once semi-natural grasslands cease to be used by low-intensity pastoral production practices the number of species that they support will decline. The failure to maintain the favourable conservation status of Natura 2000 sites has been attributed to the intensification of farming practices but also to the cessation of low-intensity farming practices (Ostermann, 1998). Where pastoralism has been abandoned, endeavours to retain the conservation interest of semi-natural grasslands through conservation management techniques have frequently failed. Conservation management has often targeted the specific requirements of a single species or has favoured the conservation of vegetation over the conservation of invertebrates. It is extremely difficult to meet the requirements of a range of taxa or species through the artificial maintenance of semi-natural grasslands (Wettstein and Schmid, 1999; Wallies de Vries et al, 2002).

The difficulty of conserving species, through conservation management practices, is exacerbated when semi-natural grasslands become fragmented and the ecological processes that maintain populations become disrupted. Research in Germany comparing the butterfly species of calcareous grassland remnants, ranging in size from 1.5 ha to 68

ha, has demonstrated a strong decline in species richness and a change in the composition of butterfly communities (Wenzel, 2006). The incidence of specialist species (defined by the authors as autochthonous non-ubiquitous species) declined by 56% and, similarly, the more sedentary species also declined by 56 %. Monophagous species declined by 66% with the greatest declines occurring in butterflies with the lowest species densities recorded in the 1970s. These declines occurred even though these sites were managed by nature conservation authorities. The authors suggest that edge effects or barriers to dispersal outside the reserves are causing these declines, possibly in combination with a loss of habitat outside of the reserve. A general decline in the connectivity of the habitat overall has increased the rates of extinction whilst decreasing rates of colonisation.

Natura 2000 sites are functionally, from an ecological perspective, part of the wider countryside (Jones, 2007). Where Natura 2000 sites have been designated for the conservation of semi-natural grasslands and their associated species, it is imperative that pastoralism continues both within and outside the legal boundary of the site. The conservation management of sites, particularly of small fragments, is unlikely to be able to replicate the heterogeneity introduced into a landscape by grazing, mowing, trampling and dispersal and furthermore, is likely to entail unsustainable financial costs (Poschlod and Wallies de Vries, 2002).

The cessation of mowing, and grazing, can lead to an increase in the number of species recorded in semi-natural grasslands in the short term (Erhardt, 1985; Balmer and Erhardt, 2000; Wallies de Vries et al, 2002; Baur et al, 2006). This has been attributed to the absence of the disturbance that grazing and mowing introduces into semi-natural grasslands. However, as the succession of the grassland proceeds, plants and species associated with pastures and meadows decline. However, other taxa may benefit from the successional change. Research on subalpine meadows in Romania has shown that whilst diurnal Lepidoptera decline in long term abandoned grasslands the numbers of nocturnal Lepidoptera can increase (Baur et al, 2006). The authors of this study

emphasise the need to ensure that abandoned grasslands are incorporated into the conservation objectives for semi-natural grasslands because different seral stages are important for different taxa. They suggest the rotational management of hay meadows and their successional stages to prevent the development of mature forest (Baur et al, 2006).

Erhardt (1985) emphasises that cultivated meadows and their seral stages are secondary habitats. The butterfly and plant species of these habitats must have once been much rarer and confined to primary grassland habitats of limited extent. *Cupido minimus* has been categorised as a typical species of a primary habitat: natural climax grassland on thin soils merging into limestone pavement (Warren, 1989). In Moeciu de Sus, the rocky calcareous grasslands may equate to a primary habitat for this species and as locations of 'source' populations from which individuals disperse into the more ephemeral hay meadow habitats. In this respect, the clearance of forest to create secondary or semi-natural hay meadow habitats could have greatly expanded the range of *Cupido minimus*. This suggests that agri-environment programmes for high nature value grasslands may be best directed to locations in which there is a mixture of both more natural and semi-natural habitats.

In Moeciu de Sus a variety of successional stages are present in the landscape. These include recently abandoned hay meadows (less than three years old), abandoned hay meadows now dominated by bilberry (*Vaccinium myrtillus*) and/or silver birch (*Betula pendula*). Juniper (*Juniperus communis*) is also present on unmown meadows on more calcareous soils. It is possible that parcels of abandoned meadow would long have been a feature in the landscape in Moeciu de Sus, albeit in small quantities, if, for example, an elderly owner becomes incapable of managing the land or dies and has no children remaining in the village. In the past however, these meadows would probably have remained unused only for a short time before being taken on by a relative or purchased by another villager. The current increase in abandoned meadows in the village is a frequent point of discussion amongst smallholders in the village who recall how

shortages of hay in the past were met by cutting forest glades at higher altitudes. This was a common practice during communism when each smallholder was obliged to supply the state with the majority of the milk produced by their livestock. In 2004 only one meadow of the 27 meadows on the five hay meadow transects was abandoned. The owner was elderly and all her children had left the village. In 2006, three further meadows were abandoned, one of which also belonged to an elderly woman. The other two had been rented in previous years by smallholders with higher than average numbers of livestock. In this circumstance, smallholders may every few years rent an extra parcel to boost their hay supplies. The increase in the number of abandoned meadows on the transects over a three year period would suggest that the trend of abandonment is occurring in the village. A change in land-use from hay production to grazing is also occurring on some parcels. This may act to enhance the heterogeneity in the landscape but could lead to a loss of species associated with mown semi-natural grasslands (Fischer and Wipf, 2002).

This research found a highly negative correlation between the intensity of meadow management and the number of autochthonous species in both years (2005 data: $r_s = -0.714$, $p < 0.001$ and $df = 33$; 2006 data $r_s = -0.667$, $p < 0.001$ and $df = 33$). At present, not all of the constituent meadows of a smallholding are managed at the highest level of intensity (for two cuts of hay). The management of the hay meadows is motivated by the need to provide a sufficient yield of hay and thus milk, not the maximum yield of either of these. Meadows that are managed at a higher intensity in Moeciu de Sus will still be comparatively species rich compared, for example, to field of silage. The negative correlation between management intensity and the number of autochthonous butterfly species provides a sufficient ecological rationale for prohibiting an increase in levels of fertilisation whether with dung, slurry or chemical fertilisers in agri-environment measures (AEMs) targeting the conservation of semi-natural grasslands. However, the grassland conservation AEMs are voluntary. In this regard, the prohibition of chemical fertilisers in the HNV grassland AEM, and the limitation of chemical fertilisers to under 40 kg N/ha in the basic grassland AEM, may act to dissuade smallholders and farmers

from entering into agreements if they calculate that more income can be gained by intensifying production. Brinkmann et al (2006) have investigated the impact of increasing the level of fertilisation of hay meadows in the Apuseni Mountains of Romania. The application of 30 t/ha of manure or 150 kg/ha NPK resulted in a loss of 25-30 % of the number of plant species (ibid).

Schmitt and Rákósy (2007) assert that 143 species of butterfly in Romania reproduce in hay meadow habitats, 53 of which are listed in the Romanian Red List for this taxa. They conclude that mechanisation and fertilisation will have 'fatal' consequences for almost all butterfly species in a variety of habitats including semi-natural grasslands. This evaluation is corroborated by research elsewhere in Europe. An investigation into the changes in butterfly populations of semi-natural grassland pastures in southern Sweden over a twenty-one year interval confirmed that species with larval host plants associated with nutrient poor grasslands decreased and those with larval host plants typical of more nutrient rich conditions increased (Öckinger et al, 2006). The species associated with dry nutrient poor grasslands were more vulnerable to extinction including *Hesperia comma* (silver spotted skipper), a species found in meadows in Moeciu de Sus (ibid). Changes in the nutrient levels of sites were attributed to both applications of (unspecified types and quantities) fertiliser and through the deposition of atmospheric nitrogen.

Schmitt and Rákósy (2007) suggest that butterflies will be less affected by higher levels of fertilisation and mechanisation in the high mountains in Romania where the natural environment limits the potential for land to be managed more intensively. However, research in Switzerland has shown that the fertilisation of subalpine meadows and subsequent increase in the frequency of mowing has a 'drastic' effect on both plants and Lepidoptera (Erhardt, 1985). Erhardt (1985) found that only two species of Lepidoptera were more abundant in fertilised meadows compared to the 30 species that were more abundant in unfertilised meadows. 32 autochthonous (here defined as species which complete their entire lifecycle in the same vegetation type) Lepidoptera species were

recorded in the unfertilised meadows compared to 12 autochthonous species in fertilised meadows. Six of the species recorded by Erhardt as occurring in unfertilized meadows were also recorded in Moeciu de Sus (*Lycaena vigaureae*, *Argynnis aglaga*, *Argynnis niobe*, *Cupido minimus*, *Thymelicus lineola* and *Plebicula dorylas*). In Moeciu de Sus, the steepness of the majority of slopes may deter attempts to increase levels of fertilisation and the number of hay crops. The cessation of meadow use or the change of use to pasture may be more likely scenarios. However, intensification of hay production may be practicable in some locations in the village and in a neighbouring village which is located on a plateau with more gently sloping meadows. It is therefore plausible that butterflies may also be affected by an intensification in land use, as well as by abandonment, in some areas of upland Romania.

Agri-environment measures (AEMs) have been used to stem the decline in semi-natural grassland biodiversity in the wider countryside and in some cases, within the boundaries of protected areas. Evaluations of these measures in mountain regions have revealed that meadows with the highest species richness of plants are also the least profitable (Zechmeister et al, 2003; Kampmann, 2007). In a Swiss study, researchers concluded that the AEM is conserving biodiversity by reducing the management intensity of some sites but is also preventing the abandonment of more economically marginal meadows located on steeper and more remote sites where higher inputs of manual labour are required (Kampmann, 2007). Regression analysis has been used to estimate the cost of compensating profits forgone (when less-intensive management practices are used) for a single species (Zechmeister et al, 2003). This equates to 150 € in a low-intensity meadow but 200 € in a high intensity meadow (ibid). This approximation indicates that, in countries where land use has already intensified, financial resources will be better spent by targeting meadows that are already managed at a lower intensity and that would otherwise be abandoned.

Whittingham (2007) proposes that, from an ecological basis, halting a decline in the biodiversity of farmland would be better achieved in western Europe, if AEM resources

were directed towards groups of contiguous farms using extensive methods where target species already occur. He argues that schemes which encourage the maintenance of small habitat elements, such as hedges and grass margins, over large geographical areas are less likely to be effective for the following reasons. Many species have contrasting intraspecific ecological requirements and the maintenance of a single habitat feature or element may fall short of the range of habitat resources that are required. With respect to metapopulation theory, the distance between habitat patches may prevent colonisation if this exceeds the dispersal ability of a species. Similarly, a patch may contain the necessary requirements for a species but if it is further away than another suitable area, it is unlikely to be used because it makes little energetic sense to travel further than is necessary. As already discussed, a further justification for this approach, in addition to those made by Whittingham, is that larger areas of extensively managed habitat are more likely to accommodate the contrasting interspecific ecological requirements of a range of species.

Whilst these arguments are valid and do justify the approach suggested, a complete switch to a protected area format for AEMs without maintaining, as far as is possible, habitat in the wider agricultural landscapes would also be to the detriment of the targeted areas (Wenzel et al 2006). Ideally, sufficient resources would be available for these approaches to run in parallel. Nevertheless, Whittingham's proposition could provide the ecological rationale for the proposed delimiting of the high nature value (HNV) grassland AEM in support of Natura 2000 sites. The maintenance of HNV farming both inside and outside of the protected area could provide 'permeable habitat' through which species can disperse (Wettstein and Schmid, 1999). The high nature value of the meadows in Moeciu de Sus, and the village's proximity to two proposed Natura 2000 sites (Bucegi Mountains Natural Park and Piatra Craiului National Park) suggests the suitability for the wider area to be delimited as eligible for HNV AEM payments. The HNV farmland approach to the conservation of biodiversity is critically important in countries like Romania where significant areas of semi-natural habitats remain and are still farmed at a low-intensity. Inevitably, the designation of Natura 2000 sites will only

capture the 'best' nature sites in Romania. The meadows of Moeciu de Sus, for example, despite seeming ecologically important from a western European perspective (by containing examples of Natura 2000 plant associations and at least fifteen Romanian Red List species) are unlikely to be included in the highest echelon of site protection because they are simply not rare enough at this point in time.

The conservation of semi-natural grasslands through voluntary measures may be more feasible in countries where the extent of these habitats is already greatly reduced and where high nature value farmland can be more easily identified. For example, in the Swiss Canton of the Grisons, 2617.19 ha alpine meadows and pastures were entered into an AEM contract in a period of four years (Baumgärtner and Hartmann, 2000). In Moeciu de Sus alone there are approximately 700 ha of hay meadow and in the neighbouring *comună* (parish) comprising three villages (Fundata, Fundățica and Șirnea) there are over 800 ha of meadow. The achievement of biodiversity objectives through AEM measures, particularly those which encourage maintenance of high inputs of manual labour (e.g. Package 2.3 Traditional Working Practices, page 172 July draft of the Romanian National Rural Development Programme, 2007-2013) also raises ethical questions in Romania particularly when the farmland targeted is managed by forms of production that are becoming socially and economically untenable. It could be argued that payments for biodiversity conservation could perpetuate a 'subsistence trap' whereby people are encouraged to work land when their labour could be better spent elsewhere in terms of generating income and raising standards of living. A more realistic and socially acceptable approach could be to target areas where there is the scope for at least some intensification of land management through fertilisation and mechanisation and the development of commercially viable forms of farming that produce saleable products and therefore have a purpose rooted in production rather than in the maintenance of museum like cultural landscapes. Here payments would be made on the premise of compensating profits forgone and for the maintenance of labour intensive practices. However, the AEMs are voluntary and may be a welcome supplement to the income of households where there is already a commitment to continue working the

land. It is conceivable that this might be the case in Moeciu de Sus, where slopes are steep and arguably more vulnerable to abandonment than intensification.

This research only scratches the surface of the relationships between the land management practices of both smallholders and herders in Moeciu de Sus and the biodiversity of semi-natural grasslands. However, it has demonstrated the role of pastoralism in maintaining high nature value hay meadow habitats, a role that could not be replicated at an equivalent spatial scale in the absence of pastoral land use practices. Further research is needed to examine the influence of land use practices on a range of taxa. This would need to incorporate an analysis of how the edaphic factors interact with management practices to determine the diversity of vegetation and invertebrate associations. Semi-natural grasslands in Romania could provide a wealth of information with which to inform the management of habitat remnants in western Europe (Per Hasund and Heldin, 2007). In western Europe, research is often biased towards modelling and small-scale fragmentation experiments (Steffan-Dewenter and Tschardt, 2002) and is often conducted in the absence of the original land use practices. For example, the movement and dispersal ability of butterflies might have been underestimated in research in western Europe because investigations have been conducted in small habitat fragments (Schneider 2003).

On the other hand, the presence of large areas of semi-natural grasslands in Romania presents a massive challenge to those charged with developing policies that will address the conservation of biodiversity. It will not be possible to achieve, in many cases, a comprehensive understanding of all the complexities of the relationships between edaphic factors, land use management and the range of species supported by semi-natural grasslands. However, evaluations of hay meadow and pasture habitats could concentrate on butterflies, as these have been shown to be effective indicators of the state of semi-natural grasslands (Erhardt, 1985; Balmer and Erhardt, 2000; Stefanescu, 2005). AEMs are voluntary and limited in their resources and are therefore unlikely to ensure the widespread conservation of semi-natural grasslands but where they are

applied it is essential that they are based on sound ecological principles. All this, however, will be in vain if the social and economic viability of HNV farming systems is not achieved. The next section of this discussion examines the wider context of the functioning of the livestock production system in Moeciu de Sus to identify the socio-economic and cultural obstacles (and opportunities) to achieving biodiversity conservation objectives.

Section 2: Key concepts and labels

Establishing the ecological relationships between land management practices and farmland biodiversity needs to run in parallel with research into the organisation and functioning of HNV farming systems. This will provide a starting point from which to evaluate how rural development measures can be used to support the social and economic viability of HNV farming systems. This in turn will require the clarification of the terms and concepts that are used to describe HNV farming systems. In this research, the term 'pastoral' is used to refer to the production system in Moeciu de Sus and 'pastoralist' is used as an umbrella term for both smallholders and herders. Salzman (2004) reminds his readers that the terms pastoralism and pastoralist are 'constructed analytical tools'. He uses the catch-all 'pastoralism is the raising of domesticated animals on natural pasture' as the basis of his definition and suggests that the term requires clarification on a case-by-case basis given the considerable variety of pastoralist systems throughout the world.

The use of 'pastoralism' can be confusing when the term is deemed to be tied to a specific form of livestock movement. Leonard and Crawford (2002) restrict their use of the term pastoralist to denote nomadism and on this basis are dismissive of the existence of pastoralists, other than the Basques and the Sámi, in Europe. They acknowledge that whilst there are 'agro-pastoralists' in the Alps of Italy and Switzerland 'visualizing Heidi as a pastoral nomad, challenges scientific credulity!' Their definition of nomadic is inadequate: 'nomadic refers to movement'... 'periodic movement' and by the vagueness of this statement, Heidi *can* be inaccurately categorised as a nomadic pastoralist. In fact, alpine pastoralism, in common with pastoralism practised throughout many European mountain ranges, entails transhumance movements, not nomadism (Campbell, 1976; Schweizer, 1988; Viazzo, 1989; Ruiz Perez and Valero Saez, 1990, Kavanagh, 1994; Cole and Wolf, 1999; Constantin, 2002; Fabre, 2002).

Jones (2005) points to the confusion in the categorisation of pastoralists as nomadic or transhumant, terms that are wrongly, he argues, used as synonyms. Nomadic pastoralism is, he writes, typified by communities that move from place to place and that utilise portable dwellings. In contrast, transhumance is practised by people who have permanent settlements, who move their livestock seasonally but who also practice arable agriculture. Part of the community may move with the livestock but some also stay in the village. Although this is a useful contribution to the conceptualisation of forms of pastoralism in the sense of describing the general distinction between transhumance and nomadism it is too rigid in its detail. An uncritical application of the term transhumance according to these criteria might exclude transhumant pastoralists that do not practice arable agriculture such as the system in Moeciu de Sus where only hay is cultivated. In a response to Jones, Tapper (2005) usefully proposes that 'distinctions are fine ones; we are dealing with a continuum'. This echoes the statement made by Salzman (2004): 'Pastoralism can thus be found associated with permanent, stable communities; elsewhere, however, it is associated with fully nomadic communities. Each is an adaptation to a particular environment, approached through the culture of the specific community'.

The United Nations' Food and Agriculture Organisation document 'Pastoralism in the new millennium' can be criticised for the use of tenurial status to conceptualise pastoralism (FAO, 2001). Pastoralism is loosely defined in this document as 'the use of extensive grazing on rangelands for livestock production' and is 'one of the key production systems in the world's drylands'. A distinction is made between the 'extensive enclosed systems' of developed countries cited here as being North America, Australia and parts of South America and 'open access systems' in Africa, Asia, the Andes and Siberia. Fenced ranges in developed countries are argued to be 'unambiguous' with regards to tenure and therefore allow greater levels of investment. Europe is omitted in this clarification but could fall within the former grouping with regards to the existence of common land and the circumstance where pastoralists may not necessarily own the land that they use. For this reason, European pastoralists may also be prevented

from making investments and can be subject to insecurity of tenure. The situation of European pastoralists is often relatively insecure and marginal in comparison to the other forms of agricultural production occurring in the continent.

The FAO document asserts that 'integrated worldwide overviews of pastoralism are surprisingly few' yet fails to sufficiently include European examples. In contrast, the definition used by the World Initiative for Sustainable Pastoralism (WISP) usefully captures the common features of pastoralism irrespective of their global location or placing on a continuum of variation in characteristics:

'Pastoralism, regardless of the extent to which it contributes to the household economy, refers to any predominantly livestock-based production system that is mainly extensive in nature and uses some form of mobility of livestock' (Hatfield and Davies, 2006).

Using the definition above, many pastoralist groups can be identified in Europe. However, whilst mobility is a common feature, it is a response to a spatial and temporal shortage of fodder. Where this shortage is not present there will be no stimulus for mobility as is the case of Fundata, a village that neighbours Moeciu de Sus. In Fundata, the occurrence of pasture in the midst of the village which, in contrast to Moeciu de Sus, is located on a plateau and is a dispersed settlement, allows some households to graze their cattle on pastures on a daily basis during the summer. Others still chose to send their livestock to a higher summer pasture where they are communally herded in a similar arrangement to that existing in Moeciu de Sus. Given that the purpose of mobility is mainly to meet spatial and temporal deficits of forage, it would seem unnecessary to discount Fundata households that use village pastures as being pastoralists. Mobility is a very common characteristic of pastoralism but it is not universal or, in the case of Fundata, central to the definition.

A more useful umbrella definition, for the purposes of this research, has been developed specifically for European pastoralism with the purpose of distinguishing between livestock production systems that play a role in conserving semi-natural grasslands and those that do not:

'Pastoralism is characterised by the grazing of livestock at low densities in large 'unenclosed' areas overwhelmingly dominated by semi-natural vegetation. This semi-natural vegetation provides the vast majority of the livestock's forage requirements throughout the year. In some areas where animals are not herded or shepherded on a daily basis, there may be fences but in general such pastures and grazing areas are so large that they are not constantly restricting the animal movements or grazing behaviour' (<http://www.sac.ac.uk/research/projects/landeconomy/featured/pastoral/> (last accessed 13 August 2008))

This definition avoids the exclusion of systems where mobility is not present and where tenure is unambiguous. It is inclusive of production systems irrespective of the degree of modernisation as long as they can be characterised by the substantial use of semi-natural grasslands (grasslands that have been created and maintained by human influence). In this respect, the livestock production system in Moeciu de Sus and in Fundata can be described as pastoralism and so too can an equivalent, yet more modern, production system in the Alps. The label 'High Nature Value (HNV) farmland' can further distinguish between production systems that play a role in conserving biodiversity:

'High Nature Value farmland consists of those areas in Europe where agriculture is a major (usually the dominant) land use and which support or are associated with either a high species and habitat diversity or the presence of species of European conservation concern or both' (Anderson, 2003).

Whilst the term pastoralism can, according to the PASTORAL definition, be applied to the livestock production system in Moeciu de Sus and the hay meadows can be categorised as HNV, it is perhaps more questionable to refer to the owners of the livestock as pastoralists. This implies a livelihood where income is predominantly generated through livestock production. Smallholders may generate all their income from off-farm work and may retain all their produce for home consumption or for exchanges in kind. In Moeciu de Sus, pastoralist is not a recognised autonym, neither is pastoralism or transhumance. Villagers recognise themselves as a *gospodar* (masculine) or *gospodină* (feminine) which translates as smallholder, a term that is sometimes used synonymously with householder. They may also express multiple identities, smallholder and forester, smallholder and shepherd etc.

Netting (2: 1993) characterizes smallholders as:

‘rural cultivators practicing intensive, permanent, diversified agriculture on relatively small farms in areas of dense population. The family household is the major corporate social unit for mobilizing agricultural labour, managing productive resources, and organising consumption. The household produces a significant part of its own subsistence and it generally participates in the market, where it sells some agricultural goods as well as carrying on cottage industry or other off-farm employment...’

As a characterisation or conceptualisation, this captures many distinctive features of smallholding based production and some commonalities can be drawn with smallholdings in Moeciu de Sus. However, care must be taken with the use of the word intensive as, whilst accurate in terms of labour input, it can infer external inputs of agro-chemicals and fuel. Nevertheless, the family household is the unit for mobilising labour in Moeciu de Sus, holding sizes are small and a significant amount of production is consumed rather than sold. There is however, considerable variation within the village in respect to the proportion of produce that is sold with some households selling none and

others selling more than half. In each case, the smallholders can not be described as self-sufficient or autarkic, a common misconception that has been applied to alpine communities in the past (Viazzo, 1989).

This raises the question of what is meant by the terms subsistence and semi-subsistence. The draft National Rural Development Plan (148: July 2007 version) for Romania defines a semi-subsistence farm as a holding that 'produces, in particular for self-consumption and also markets part of its output. The economic size unit of a semi-subsistence farm may fluctuate between 2-8 ESU [economic size unit]. In order to become viable, the semi-subsistence farm could also practice non-agricultural activities generating incomes'. One ESU is defined by the EU (Commission Decision 85/377/EEC) as a total standard gross margin of the holding of the value of 1, 200 €. 71% of all holdings in Romania are the equivalent of 1 ESU and would therefore be defined, using this criterion, as subsistence holdings.

The term semi-subsistence is used throughout this thesis as this better represents the characteristic of only part of a household's subsistence being provided for by the smallholding, as is the case in Moeciu de Sus. Elsewhere in Romania, where the opportunities for off-farm income generation are lower, it may be the case that the term subsistent is more accurate. The definition given above is suggestive that smallholdings are failed commercial enterprises. The reality is that they form a part of a household's livelihood strategy and are not profit making enterprises in many instances. As such, it is important for policy makers to acknowledge that the motivation of production on smallholdings is not, in every case, economic competitiveness. Semi-subsistent production in this respect might be termed peasant production or as involving a peasant economy. Although the term peasant is not used by the smallholders in Moeciu de Sus to describe themselves they would acknowledge that their mode of production is '*tărănesc*', peasant-like or country-like, a term that may also be used to imply cultural heritage. The term peasant, however, is not used in this research because of its arguably

more common usage, in Romania as elsewhere, as an insult that implies ignorance and backwardness.

This examination of the concepts and definitions relating to pastoralism, pastoralist, smallholding and smallholder reveals that the only certain characteristic in all of these concepts is heterogeneity. Even within one village, there may be sufficient variation in livestock production practices to warrant any one definition insufficient. A pragmatic approach towards conceptualisations of agricultural systems is therefore required to guide the formation of policy so that characteristics such as mobility, tenure or subsistence can be appropriately accommodated and understood. In this respect, the development of a typology of pastoral production systems using illustrative case studies might capture the general variations and improve the understanding of pastoralism amongst policy makers and a range of stakeholders. This would be of particular use for the conceptualisation of semi-subsistence and subsistence production and in distinguishing of modes of production that have a value for the conservation of biodiversity. By a number of definitions, pastoralism does occur in Europe and can incorporate forms of mobility and complex tenurial arrangements. Its reliance, whether part or full, on semi-natural vegetation, singles it out from other forms of production for the important role it plays in the conservation of biodiversity in Europe. Furthermore, the terms pastoral (and derivatives) and smallholder could be used in the raising of awareness and status of, and hence pride in, production systems that play a critical role in the conservation of both natural and cultural heritage.

Section 3: Practicability of land management measures, land tenure and labour

The current existence of large areas of semi-natural grasslands in Romania might appear to provide a good basis for the conservation of these habitats. Particularly when contrasted with situations where the intensification of land-use practices has already lessened the conservation value of semi-natural grasslands (Riley, 2006). However, this favourable starting point has to be balanced against the knowledge that, in Romania, semi-natural grasslands are being conserved by pastoral systems that are in many cases far from socially and economically viable. The current practices of smallholders may be well aligned with the management requirements of the HNV grassland AEM (see paper 2 of this thesis) but this conservation is a consequence of the necessity of the majority of rural households to provide for their own table. If the intensification or the abandonment of subsistent or semi-subsistent production makes more sense, the conservation of semi-natural grasslands will cease. In the short-term, it would seem that rural households will remain reliant on semi-subsistent or subsistent forms of livestock production and that AEM payments could provide a welcome addition to a household's income. It is therefore essential that the rural development measures directed at the conservation of semi-natural grasslands need to be workable from the perspective of both smallholders and herders.

Although smallholdings are not managed for commercial gain, the uptake of voluntary agri-environment agreements and optional LFA support by smallholders and shepherds is likely to be determined, to a greater extent, by economic reasons (Wilson and Hart, 2001; Siebert et al, 2006). However, non-economic reasons have also been found to factor in the decision making processes that determine whether farmers participate in non-mandatory environmental and conservation agreements (Harrison et al, 1998; Wilson and Hart, 2001; Burton, 2004; Sikor 2005; Siebert et al, 2006). In a comparison of the uptake of two contrasting agri-environment schemes in the UK, Wilson and Hart (2001) report that 'goodness of fit', the compatibility of the conservation management

requirements with the farm management plans, featured strongly in the reasons given by farmers for their entry into schemes. This same reason is similarly identified by Siebert et al (2006) who have reviewed 160 publications and research reports from six EU member states to provide an overview of the various factors that determine the participation of farmers in biodiversity policies. As discussed in the second paper of this thesis, the current level of management intensity of the meadows in Moeciu de Sus is within the limits set by the requirements of the proposed HNV grassland AEM, with the exception of the prohibition of the cutting of hay before July 1st. Adherence to the management requirements of the HNV grassland AEM would, in most cases, not require any departure from current management practices.

However, the management requirements of the HNV grassland AEM may be less compatible with the current land-use practices of shepherds and herders in the case of Moeciu de Sus. Here shepherds can rent the local commons on an annual basis and the AEM requires a tenurial period of five years. Theoretically, shepherds who rent locally administered pastures are already bound, by local regulations, to keep the pasture in good condition, although the monitoring and enforcement of these rules is not always achieved, particularly for the remoter pastures. This research did not attempt an analysis of the conservation value of the semi-natural grasslands used for pastures by the villagers in Moeciu de Sus but there are reports that both overgrazing and undergrazing are threatening the conservation value of mountain pastures in Romania (Turnock, 2002). Tenurial restrictions allowing, it might be more attractive for shepherds to secure the Less Favoured Area (LFA) funding than the AEM payments. Although the AEM payments per hectare are higher than LFA payments, the management requirements of the latter are less demanding and would involve little change in current pasture management. However, the grazing prescriptions of the proposed grassland AEMs (see the Appendix of the second paper of this thesis), may receive criticism from conservationists for not being more restrictive. This group of stakeholders could argue that the prescriptions are too broad to secure the optimum management for the conservation interest of pastures (particularly as the basic grassland AEM permits the

intensification of pasture and meadow management through the application of chemical fertilisers). The development of more locally tailored management prescriptions is not possible at the present time as monitoring compliance has to take place with limited resources and capacity. It is more critical to ensure that both grazing and hay production continue to occur.

There may be more divergence, in terms of the goodness of fit between existing land-use practices with the mandatory management prescriptions of Natura 2000 sites. Siebert et al (2006) describe the response of Finnish farmers to the designation of Natura 2000 sites. Their opposition to the designation of sites was based upon feelings of not being properly informed during the designation process and that their views had been insufficiently respected. Many of the proposed Natura 2000 sites in Romania are already designated as National Parks or Natural Parks and shepherds using pastures in some of these areas may have previous experience of grazing restrictions. Similarly, park managers will have had experience of trying to negotiate the needs of shepherds with the conservation of pastures. The manager of the Rodna Mountains National Park in northern Romania has commented on the difficulty of achieving the rotational movement of the sheep fold or temporary animal enclosures to avoid excessive nutrient accumulation and trampling. Certain sites on a pasture may be preferred by the shepherds because they are more suitable for defending livestock from large carnivores or are more sheltered.

It is therefore imperative that shepherds and other land users are kept fully informed of the AEM and Natura 2000 implementation process and of the rationale for management restrictions. This might help to avoid, as in the case of the Finnish example, an impression of arbitrariness on the part of the government officials and conservation authorities. As the case of the Rodna National Park confirms, there needs to be a dialogue between land-users, conservationists and policy implementers to ensure that management prescriptions are workable on the ground. Whilst shepherds and smallholders may have little power to influence the designation of Natura 2000 sites,

their support will be critical to achieving the conservation of semi-natural grasslands. Zechmeister et al (2003) have reported that biodiversity conservation measures have sometimes been rejected by farmers in Austria because information about the potential advantages of entering a scheme has been lacking. The communication of the objectives and progress of both AEMs and Natura 2000 sites, if sensitively handled, could potentially engender a sense of pride in both shepherds and smallholders in the value of their land management practices for biodiversity conservation. This could stimulate the transition of scheme entrants from 'passive adopters' to 'active adopters' (Wilson and Hart, 2001) particularly if the profile and status of HNV farmers is raised amongst the general public. Wilson and Hart (ibid) emphasise the importance of including follow-up monitoring schemes with the purpose of communicating to farmers the results of their 'conservation' management, to reinforce the message that their efforts are being valued. This suggestion is made with references to 'productivist' agriculture whereby farmers have had to de-intensify production on part of their farm to qualify for AEM measures. However, it could equally apply to 'pre-productivist' production systems in Romania.

In the Romanian context, the novelty of voluntary AEM payments might prove off-putting to many, particularly those unaccustomed with handling complex application processes. Extension workers have in some cases improved the uptake rate of voluntary measures by facilitating AEM application processes however, this would prove difficult in Romania where resources are very low and the number of holdings is very high. A lack of resources and the relatively low capacity of the administering authorities may also limit anything more than the most perfunctory monitoring of AEM schemes. An AEM in Switzerland that secured the participation of 947 farmers (30% of the total number of farmers in the Canton) and entry of 2617.19 ha was deemed effective but entailed the input of 39 'paraecologists', volunteers from within the local area trained in plant identification and monitoring as well as advisory and communications skills (Baumgärtner and Hartmann, 2000). Checks will be made in selected areas to monitor scheme compliance but it is unlikely that resources will allow the monitoring of either

the effectiveness of the scheme in achieving the conservation of semi-natural grasslands or in gauging the practicability and acceptance of the scheme amongst land-users.

Land tenure

The combination of private and collective rights to land in Moeciu de Sus adds a layer of complexity to the achievement of the biodiversity objectives of land management measures. As discussed in the second paper of this thesis, eligibility for the axis 2 measures of the RDP in Romania will require proof of use rather than proof of ownership. If Moeciu de Sus became delimited as an area eligible for the HNV grassland AEM, tenure is unlikely to be an obstacle to the voluntary uptake of hay meadow owners. However, the tenurial arrangements of the communal pastures in Moeciu de Sus may prevent the entry of pastures into the AEM measures. Wilson and Wilson (1997) report that no 'true commons' were entered into the Cambrian Mountains Environmentally Sensitive Area (ESA) AEM, only those used by one or two farmers, and suggest three reasons for this. Firstly, existing stocking levels were higher than those stipulated by the ESA agreement and a reduction in livestock numbers would have economically disadvantaged users. Since the time of this research, production subsidies have been decoupled from headage payments so theoretically, this pressure should have eased. Secondly, the agreement of all the users was a necessary criterion of eligibility but difficult to achieve in the absence of a management committee. The need for a representative management body has been identified as a general pre-requisite for the entry of common land into AEMs when there are a number of graziers (Land Use Consultants, 2005). Where traditional forms of commons management have become moribund (e.g. committees or less formally the monitoring and regulation of pasture management by all users) the establishment of a participatory, community based formal body could take on a monitoring role and also negotiate potential conflicts arising between the use of commons for grazing, amenity and biodiversity conservation (McKenna et al, 2007). Thirdly, entry into the Cambrian Mountains ESA would have

entailed costs (for fencing and pasture weed control) that would not necessarily have been reimbursed.

It will be interesting to observe whether commons will be entered into voluntary AEM agreements in Romania. This may occur if the pastures are leased by one person and where the five year tenure stipulation can be met, but is less likely to occur in situations where there are many users and not one single responsible party. It may be that the payments accrued to a number of users will not be enough to attract applications, even if there is sufficient agreement and will amongst all the owners of livestock using the commons to enter in to an AEM agreement. As is discussed in a following section, the will for associative action in Romania is often absent. Nonetheless, the establishment of management committees for the commons could result in solutions being found for the management and monitoring of the condition of pastures. In Moeciu de Sus, it is likely that livestock owners were once obliged to contribute labour to the management of pastures.

In the neighbouring village of Fundata, where there are pastures embedded within the more dispersed settlement on a plateau, there is a local law stipulating the terms and conditions of pasture management. This obliges the relevant livestock owners to contribute a day of labour for pasture maintenance. However, livestock owners can pay to waiver this obligation. An official did verify that the pastures were cleared of weeds and saplings in the spring but described the difficulty of maintaining associations of pasture users. He attributed this to a legacy of coercive cooperative action during communism. In Moeciu de Sus at present, the responsibility of the pasture management lies with the shepherd who has gained the tenure. The establishment of a committee that could oversee both the management and monitoring of pasture condition would ease the pressure on the already overstretched capacity of the government authority that will be charged with assessing compliance with the management requirements of rural development measures. Furthermore, this could allow more locally targeted biodiversity conservation objectives with the setting of grazing management requirements that reflect

the capacity of the pasture. The committee would also be able to negotiate these requirements where they prove impracticable for the users of the pastures. However, as indicated by the Fundata official, it will be difficult to stimulate and maintain associative action.

There are reports of both the overgrazing and undergrazing of upland pastures in Romania (Turnock, 2002). Overgrazing has been identified as a problem for the conservation of calcareous semi-natural grassland pastures in Piatra Craiului National Park, the closest protected area of this status to Moeciu de Sus (Marusca, 2000). The number of livestock grazing on the pastures has been assessed as being two to three times more than the capacity of the pasture capacity. At present in Moeciu de Sus, the three village pastures are used to the maximum capacity set by the village administration, in total approximately 250 cows and 700 sheep. Since 2006 each household has the right to send a maximum of two cows to a village pasture and this theoretically equates to 125 households. The remaining households send their livestock to a fourth privately owned pasture in the nearby mountains or to one of the many privately owned pastures in the lowlands. An assessment of the conservation value of the commons in the village was not made in this research but anecdotally, there is a suggestion that the numbers of stock are high and that towards the end of the summer, forage deficits encourage shepherds to illegally take sheep into the forests.

At present, the ability of smallholders to vote shepherds on or off pastures does to a certain extent prevent the 'tragedy of the commons' (see McKenna et al, 2006) whereby pastures are overstocked for maximum individual gain at the expense of all of the users. McKenna et al (ibid) suggest overgrazing can arise when systems for pasture management breakdown often, when the use of the pasture declines into the hands of a few, and exacerbated, as has been the case in the EU in the 1980s and 1990s, by production subsidies that have encouraged high stocking levels. The decline in use of commons by smallholders in Moeciu de Sus might lead to their *de facto* privatisation (Myrvang Brown, 2007) and pave the way for individuals to attempt to purchase the

land whether for livestock production or for other uses e.g. tourist developments. There has already been a rumour in the village that a shepherd intended to buy one of the three village pastures for his own personal use but at present the demand for pasture spaces is too high to enable this to occur. In another instance in Moeciu de Sus, a shepherd who exceeded the grazing pasture by 30 cows was voted off the pasture in the following year. However, this is a reactive approach to regulation in comparison to the system of commons management that Netting (1981) describes for the Swiss mountain village of Törbel. In Törbel an annually elected individual (the power-holder or *Gewalthaber*) would have been given the task of administering the pasture and fining individuals who exceeded their livestock quota (Netting: 61: 1981). In addition, an elected committee of cattle owners and an annual assembly of all pasture users also contributed to the regulation of pasture use (Netting 176: 1993). Each household would also have been obliged to contribute labour to the maintenance of the pasture on communal workdays (*Gemeinwerk*). With these controls in place, the overgrazing of commons would have been avoided by close regulation and pasture maintenance would have been enforced. It is possible that similar regulatory procedures once existed in Moeciu de Sus, particularly as there was at least one *obște* in the village. In Romania *obști* (the plural of *obște*) is the term given for the corporate management of forest and grazing resources. These became moribund during communism but further research could establish the feasibility of reinstating or adapting this type of corporate resource management in light of the prevailing reticence towards associative action.

The sale of private land along the valley floor in Moeciu de Sus, often forming part of the 'courtyard' of the smallholding and previously mown for hay, has become an attractive option for many in the village who have capitalised on the attractiveness of the area as a holiday and second home destination. This popularity of the village increased in 2004 after the surfacing of the 8 km of track that connects the village with the main road. The price of land per m² in the wider Bran-Moeciu area is now one of the highest outside of the Romanian capital. There is speculation that once the flat land in the valley bottom has been saturated, building may continue on some of the gentler slopes or even

on the plateaus of the surrounding hills. By 2007 there had only been one purchase of land, by an incomer, for the construction of a holiday home and stables for horses on the higher meadows. If this trend continues there could be considerable implications for the conservation of the meadows as the money earned from the sale of land may be greater than the income from rural development measures.

The process of selling and buying land is at present complicated by the disarray of land registration records. These were not updated during the communist period, as theoretically at this time, private land ownership was forbidden and transferral of ownership occurred on an informal and non legal basis. Land continued to be exchanged in the village whether by straight purchase, inheritance or marriage but records were not updated and many meadow owners remain at present without proof of ownership. In order to sell land, it is first necessary to prove ownership. When a person wishes to obtain a deed for their land and do not have the unique topographic number that each parcel had been assigned before communism, they must go to each of the owners of the neighbouring meadows to obtain the topographic numbers for these parcels. This can be a lengthy and frustrating process, particularly if the neighbours themselves are without deeds. However, proving ownership in this situation is less complicated than it is for areas that were collectivised. The restitution of land and the transition to exclusive private ownership rights from collective rights has proven far from straightforward (see Verderey, 1998). Many disputes have arisen in the village during the establishment of legal ownership over parcels of meadow, particularly on the lower slopes. In common with Verderey's account (1998), weaker householders (e.g. lone elderly people) are often forced to seek proof of ownership following an aggressive move by more powerful households who seek to claim rights over land.

The steepness of many of the hill slopes may prevent the widespread development on the meadows in Moeciu de Sus and similarly, might make the intensification of hay meadow management practices impracticable. However, the conversion of the meadows (in some cases re-conversion) into pasture might be a more feasible option. There are

already meadows in the immediate and wider area that have ceased to be used as such and that are now rented by shepherds to increase their summer grazing resources. The purchase of higher meadows by an incomer, as already mentioned, has led to the consolidation of several contiguous parcels to form a discreet area of 40 ha, a considerable size in comparison to most parcels (1-2 ha). Some of this large parcel will continue to be managed for hay but the remainder is now being used as pasture during the entire summer for the owner's 'leisure' horses. The conversion of meadows to pastures is likely to lead to a decline in the number of plant species (Fischer and Wipf, 2002). At present, the purchase of this land is not viewed by villagers as a profit making enterprise, more the folly of a very rich person. It is plausible though that land may in the future be purchased for the purpose of commercial livestock production and that the least accessible meadows may be converted to pastures.

The fragmentation of holdings is often cited as an obstacle to the development of economically competitive farms (143: RMARD, 2007; 32: Căndea and Zamfir, 2000; 15: OECD, 2000). Restructuring, which is not defined but implies consolidation of smaller holdings and an increase in parcel size, will be achieved through measure 141, support for semi-subsistence holdings (147: RMARD, 2007). Successful applicants to this measure will receive 1, 500 € per year for five years. It is more probable that the restructuring of agricultural holdings and the consolidation of land will be concentrated in the lowlands where the potential for economically competitive production is greatest. However, should the same trend occur in the uplands there could be negative consequences for the biodiversity of semi-natural grasslands.

The development of more commercially viable holdings in the lowlands may also have implications for upland livestock production systems. In Moeciu de Sus there is insufficient upland pasture for all the livestock in the village. This necessitates the movement of approximately 100 cows and 1000 sheep to the lowlands during the summer months. The 1000 sheep that do graze the upland pastures during the summer are also grazed in the lowlands during the spring and autumn. Lowland grazing

resources may be lost if pastures in these areas are converted to arable or more intensive livestock production systems.

Labour

Netting (1981), Viazzo (1989) and Cole and Wolf (1999) all describe the 'pivotal' role of household labour in alpine pastoral systems, particularly predating the introduction of labour saving technologies. Manual labour also plays a pivotal role in conserving semi-natural grasslands as the introduction of labour saving changes in land-use practices often leads to a decline in species as described in the first section of this discussion. Netting (48:1981) estimates that in 1901, holdings in Törbel would have had on average 2.28 cows and that this number of stock would have necessitated 195 days of labour for the entire hay making process. Petrol mowing machines, introduced from the 1950s onwards, are attributed with preventing the abandonment of many meadows when off-farm employment lessened the availability of male labour. Petrol mowers can shave-off a fifth to a quarter of the time that it takes to mow a meadow with a scythe (*ibid*). In an Austrian alpine production system, food production per working hour has increased by a factor of seven since the introduction of artificial fertilisers and mechanisation (Kraussman, 2004).

The petrol mower has not yet arrived in Moeciu de Sus and every meadow is mown by hand as would have been the case over fifty years ago in the Alps. Scything is a predominantly male task although there are women in the village that are also skilled in this work. Where a family has a shortfall in labour for the mowing event, it is common for itinerant workers to be employed but where possible family resources are used to avoid expenditure. In many families, the grandparents contribute the most labour to the hay production process. Where this is the case it is unlikely that households could increase their off-farm income by releasing labour from the smallholding. Furthermore, by ceasing to manage a smallholding, the importance of the older generation in contributing to the maintenance of the household would diminish although child care

duties would still be likely to fall on the grandmother. The importance of grandparents in providing a substantial amount of labour on smallholdings renders measures encouraging the transferral of holdings from older to younger generations inappropriate in many cases (31: RMARD, July 2007 version). The reliance on family labour can make smallholding based production a viable (and albeit arduous) component of livelihood strategies where hired labour, other than the employment of itinerant hay cutters, would be untenable (ibid).

Cole and Wolf (1999) recount (from fieldwork conducted in the 1960s) the common 'lament' of alpine villagers in Italy: 'I live for my cattle'. The introduction of labour saving practices, if finances allow, renders more labour intensive practices socially unacceptable. Viazzo (1989) describes how the term *pur* (the Italian equivalent of the German *Bauer*, farmer or peasant) had only survived in usage in an alpine Italian community in the phrase 'to work like a *pur*' or 'as hard as a beast' by the early 1980s. At this time, the number of people engaged in farming activities had dwindled to 24 from 141 in 1951, if the census data for this year was accurate.

In Moeciu de Sus, people do not liken themselves to working like a *gospodar* or *gospodină* in the same sense that Viazzo describes because it is still the occupation, whether part or full-time, of the majority. The toil is accepted as an inevitable part of life and frequently people will say 'what else are we to do' followed by a request to God for good health so that they may continue to be able to work hard enough. Some people do indicate resentment at labouring on smallholdings often when siblings have moved to a city where they are perceived to lead a more comfortable life. One villager reported that as she was turning drying hay in her courtyard a passing woman, who had recently become wealthier from developing tourist accommodation, had expressed thankfulness for no longer having to work outside. It is also possible for individuals to express contradictory attitudes to smallholding livelihoods. A woman, a staunchly proud *gospodină* who has worked all her life on her smallholding takes great pride and

expresses pleasure in a task well completed but also harbours aspirations that her grandchildren will work hard at school so that they can escape 'this miserable life'.

Netting (325: 1993) reports that the education of children is often highly desired by Chinese and the Ibo smallholders of Nigeria as a means to supplement off farm income. Netting (ibid) does not clarify, however, whether the children continue to contribute labour to the smallholding and if not, whether they return to it after gaining an education. The practice of partible inheritance is likely to have necessitated out-migration to a certain extent in the village. However, it is more than likely that young adults will choose not to maintain a smallholding if they secure off-farm incomes that make this unnecessary. However, the hard work entailed in managing a smallholding is mainly respected and is seen as the norm. There is still more of a stigma associated with not working your land and it is seen to be somewhat shameful to leave a meadow fallow. This corroborates a report of 'the strong attachment to farm work as a mark of respectability ('avoiding the wrong impression to neighbours')' in a village in the same county in Romania (Muica and Turnock, 2000).

Shepherds are generally well regarded by the smallholders in Moeciu de Sus but they themselves recognise that they can have a low status in Romanian society. One man is rumoured to not have married his girlfriend because her parents would have disallowed the match on the basis that she could do better than marry a shepherd. It is also openly acknowledged that some, but by no means all, shepherds went into the profession because they were 'no good at school'. This is not seen to be shameful though and a shepherd that does his job well is respected by smallholders regardless of the reason why he entered into the profession. The warm, respectful and grateful reception that the shepherds receive from the villagers when they herd the cattle down from the pastures at the end of the summer also indicates that the role of the shepherds is still highly valued by the smallholders. However, the reported increase in difficulty of hiring skilled shepherds suggests that this profession is becoming less acceptable to those that practice it because of the high degree of toil and harsh working conditions. The shepherds in

Moeciu de Sus may work every day with little sleep for many months at a time. Those working on upland pastures endure particularly harsh weather and may be required to defend stock from bears and wolves. Shelter and food is rudimentary and the pay is often lower than the salary of men working in other sectors who have comparatively better working conditions. However, it is important to distinguish between the different categories of shepherds. Hired shepherds may have very few sheep or cows of their own compared to the shepherds who hire. Hired shepherds therefore have less of an incentive for continuing with the livelihood should an alternative and more attractive possibility for generating income arise elsewhere.

Kostov and Lingard (2002) conclude from research undertaken in Bulgaria that 'the main reasons for the emergence of subsistence agriculture are largely non-agricultural and of a general economic nature'. The concentration of academic commentary on the economic consequences of re-peasantisation, the re-emergence of small-scale farms, in central and eastern Europe neglects the situation where smallholdings existed throughout the duration of communism. Furthermore, research often ignores the holism of this type of production (Small, 2003) by concentrating only on economics and profitability. Kostov and Lingard (2002) highlight the assertion by Sarris et al (1999) that the polarisation of agriculture between large units of production and semi-subsistent and subsistent production in central and eastern European countries is 'neither efficient nor equitable'. Small (2003) instead suggests that 'Far from being a 'problem' for rural development or agrarian transition, both structures represent inherently functional and rational practices given the current context'. This is particularly relevant in the case of smallholding based production in the uplands where the potential for larger units of production will always be lower than in the lowlands where the terrain is more amenable to more intensive land-use practices.

The smallholdings in Moeciu de Sus have not re-emerged in recent years and households have been pluriactive before, during and since communism. At present, most households generate income through off-farm work. Of 19 households asked whether they sold their

products, three sold them outside of the village on an established commercial basis (directly at a market and to a 'middle-man'), one sold produce on the road-side at a popular tourist spot and 15 kept the majority of their produce for their own consumption which includes for use in their own tourist accommodation if owned (both informal room letting and more formal guesthouses). Some of these 15 admitted to selling milk informally within the village in low quantities on an ad hoc basis should they be approached by a neighbour for example. Only 20 households (less than 10% of the households in the village) sell milk to the local collector as few have sufficient surplus to warrant this and ad hoc sales generate higher prices per litre. This small sample indicates the general 'not for profit' mode of production in Moeciu de Sus and the dependency of most households on off-farm income. This off-farm income is used to pay for the cost of the summer pastures, the purchase of piglets, the replacement of equipment (hay rakes and scythes), the payment of itinerant hay cutters if employed, timber for barn construction and any supplementary fodder (maize and wheat husks) if this is bought. In Moeciu de Sus the popularity of the village and wider area as a destination for tourists and the relative proximity of the village to urban centres provide opportunities for off-farm employment. Additional income may be raised by the seasonal or longer duration emigration of a household member. The opportunities available to smallholders in Moeciu de Sus, particularly in the tourism sector, may not be present in mountain communities elsewhere in Romania where incomes may be lower and the dependency on production for home consumption may be higher. In both cases, the generation of off-farm income is critical. Pastoralism could be made more socially and economically viable by strengthening the links between the generation of both on-farm and off-farm income and the conservation of natural and cultural heritage.

Section 4: Cultural obstacles

Barriers to participation: apathy, distrust and social capital

Mihailescu (2000) cautions that a lack of trust in associative action should be anticipated as a potential obstacle to rural development projects in Romania. To a certain extent, key informants in Moeciu de Sus and a neighbouring village corroborated this in the expression of reticence towards the idea of associative action, particularly for the purposes of production and sale of produce. Individuals reasoned that it is difficult to trust others because 'these days, every one is just looking out for themselves'.

Mihailescu (ibid) cautions against unduly pinning the causes of the failure of development projects on apathy, the legacy of the 'paternalism' of communism and the attitude that the state will and should provide. It may be that development projects lack relevancy to those that they are designed to help. Mihailescu gives an example of villagers trading vouchers given to them for the purchase of 'better' cattle feed for chickens. Promoting the use of chemical fertilisers on smallholding meadows might also be an analogous situation. In Moeciu de Sus, smallholders are often of the opinion that chemical fertilisers are a waste of money when dung works perfectly well and does not need to be bought. In a second example from Moeciu de Sus a family secured funding to obtain an electric milking machine but this was still sat unused in a barn. They explained that they could not find shepherds skilled in its use, that it required a generator and besides, the cows were not used to it. Most of all it was like having 'a washing machine only to wash a single pair of pants'. They believed that the technological approach is more appropriate for lowland pastures.

There are, however, indications that apathy and distrust (both in horizontal and vertical structures of governance) do exist in Moeciu de Sus and the surrounding villages. A local official from a village neighbouring Moeciu de Sus talked of the difficulty of

forming associations for the management of pastures and attributed this explicitly to the distrust generated amongst the villagers by their experiences during communism. Although villagers in Moeciu de Sus were not collectivised, they were still subject to crippling high production demands by the state and the overhanging and insidious threat of systemisation. Kideckel (xiii :1993) surmises that local corporatism has been lost in Romania: 'The socialist system, though ostensibly designed to create new persons motivated by the needs of groups and of society as a whole, in fact created people who were of necessity self-centred, distrustful, and apathetic to the very core of their beings'. The social consequences of communism in Romania can be likened to the culture of apathy that Douglas (2002) suggests emanates from the loss of autonomy following 'conquest or from the economic development it ends up hampering'.

Overcoming apathy and distrust will be important to achieve many rural development objectives. However, as Thin (65-67: 2002) is clear to emphasise, addressing social dimensions within development policy or initiatives should be primarily attempted for intrinsic reasons. Often the inclusion of social objectives in development projects is instrumental, seen as a requisite to achieving economic goals rather than as important for its own worth. This is a criticism that can be levied at the text of the strategic guidelines for rural development for the programming period 2007-2013 (2006/144/EC). In this document the conservation of biodiversity would appear to be given intrinsic worth but improving quality of life and building local capacity are more instrumental to achieving economic objectives. In this document, building local capacity is an important 'horizontal priority' in the improvement of governance and mobilising endogenous development. Horizontal linkages are central to the concept of social capital as propounded by Putnam (90: Thin, 2002) which is seen as a necessity for both economic development and democracy. Small (2002) questions the usefulness of the social capital concept and, specifically, using the existence of associative organisations to indicate horizontal linkages in communities. In an analysis of rural communities in post-socialist Russia Small concludes that social capital as defined by Putnam is absent yet 'some forms of community norms and social connectivity certainly exist'.

These norms and social connectivity might be better encapsulated by the classification of social capital included in the World Bank's 2000/1 World Development Report as described by Thin (1992: 2002). Bonding social capital can encompass the connectivity between family members, neighbours and close friends; bridging social capital represents relatively weaker ties between for example, colleagues or members of civic associations; and linking social capital corresponds to the vertical relationships between the generally less powerful and those with power. In the context of Moeciu de Sus, smallholders and shepherds could be described as having strong bonding social capital particularly at times of high demand on labour during hay making or the transhumance up to the summer pastures. However, there is weak to absent bridging social capital and absent linking social capital. Following this logic, the formation of bridging social capital would be insufficient in itself if linking social capital is not also established. Linking capital would require the commitment of those responsible for the implementation of rural development policy both at the local, national and European level to establish networks for communication with the people implementing policies on the ground. It would also necessitate that care is taken to ensure that the development of bridging social capital does not occur at the exclusion of weaker groups. A strong agricultural association representing economically competitive agri-businesses is unlikely to voice the needs of small commercial producers and semi-subsistent producers.

Participation in both horizontal and vertical networks would require the re-emergence of trust and will. Regaining trust after the cultural breakdown caused by communism will be a slow process. It is possible that the economic advantage that could be gained by forming producer groups might be stimulus enough for people wishing to develop commercial production on their land. However, incentives to associate may be less for non-commercial producers unless, for example, a link is established that valorises tourist accommodation that is supplied by this category of producer. Staying in an 'agropensiune' is no guarantee, at present, of being served local or home produce. Incomers,

in the wider Moeciu area for example, are keen to cash-in on this label without actually running a smallholding, whilst locals underestimate the kudos that advertising home produce might bestow on their accommodation. Nevertheless, tourism could provide a means of increasing the socio-economic viability and status of pastoral modes of production in the mountain regions of Romania.

The lack of associations that represent the interests of smallholders and shepherds will hinder the identification of AEM management prescriptions that are not workable on the ground. Furthermore, forums for exchange between stakeholders from 'all rungs of the policy ladder' (see La Cañada, No. 20, 2007) could potentially secure more support for the conservation objectives than a purely top down approach in the absence of linking capital. For instrumental purposes, engaging those who will be faced with the task of moderating land use practices might lead to a greater acceptance of both voluntary and mandatory measures. For intrinsic purposes, it is important that pastoralists are able to indicate when management requirements are impracticable and more importantly when the functioning of the production system is being threatened, for example, by the difficulty of hiring skilled shepherds. More fundamentally, the participation of rural communities in horizontal and vertical networks in Romania might also seek to redress unresolved issues of social justice that still linger twenty years after the revolution. In Moeciu de Sus for example, communism caused the dissolution of at least one *obște*, a form of corporate management of forest and grazing resources. The re-instatement of corporate forms of resource management could also re-integrate forestry in to the pastoral production system, a link that was broken following the nationalisation of the forests in 1958.

Increased associative action might lead to trade-offs between nature conservation management and economic development but it might also lead to the identification of common ground, for example, between the opportunities to brand produce and tourist accommodation as having a nature conservation value or in the generation of income by the collection of medicinal plants that grow in hay meadows. Achieving participation

and the intersection between horizontal and vertical linkages in Romania will be challenging but nevertheless, is important for both instrumental and intrinsic reasons. It could create what Douglas (2002) describes as enabling environments where the 'quality of exchanges are high if the options for interaction are many and free'.

External misconceptions

Thin (see chapter 5: 2002) suggests that the concept of solidarity is one of the four processes necessary for social progress. Solidarity concerns 'cohesion, empathy, co-operation and associational life' and 'is as central to the concept of society as production and exchange are to the concept of economy'. It can increase 'mutual understanding' and can be used 'to improve relations between people who are separated both by spatial distance and by inequalities of power' (ibid). The concept might be expanded to include the breaking down of misconceptions between different groups of people and to use the greater understanding and empathy that ensues to improve, for example, the development of policy.

Douglas (2002) is vehemently critical of the division of culture by economists into a type that is individualist, progressive and modern and another that is corporatist and traditional. Netting (7:1993) has argued that modernisation is too often regarded as a linear or evolutionary process that categorises different types of farming according to the use of technology. In the pursuit of the economic development of agriculture, smallholders, he claims, have become 'invisible' or 'embarrassing' (27:1993), 'stigmatized as old fashioned', 'ignored' and a 'barrier to modernisation' (9:1993). Viazzo (100: 1989) also recognises this evolutionary dichotomy in the classification of alpine livelihoods: agricultural or pastoral work has been described as traditional and employment in industry or tourism has been described as modern.

Viazzo challenges this simplistic perception of the transition of alpine communities. He emphasises that whilst agriculture and pastoralism had been a constant in the economic and social systems of the village which he researched, livelihoods had rarely been reliant only on these activities. The community had become more autarkic, or self sufficient, only in times of economic recession. Viazzo emphasises that descriptions of Alpine communities in the latter half of the last century may have measured transition in these communities against the period of re-peasantisation that occurred before and during the Second World War, ignoring the pluriactive nature of livelihoods in these communities previous to this time.

Similarly, in mountain communities in Romania there are indications that off-farm income was important before communism. Two oral histories collected with older men in Moeciu de Sus and Moeciu de Jos recorded the importance of shepherding and forestry as sources of income for male villagers before the Second World War. Muica et al (1999) describe how people from the village of Poiana Marului, also in the county of Braşov, were already commuting to work in nearby industrial centres before the Second World War. However, neither Viazzo (1989) nor Netting (1981) are thorough in their consideration of the decline of pastoralism in the livelihoods of the communities in which they worked. The reader is left uncertain as to the weight of the various factors that culminated to precipitate this decline. Potthoff (2004) also criticises the perception of traditional farming systems as being viewed as static in the past in an analysis of seasonal mountain farming in western Norway. Potthoff also only briefly alludes to the reasons for the abandonment of transhumant summer farming in Norway and describes these as personal, practical and economic with an emphasis on the latter. The establishment of pastures on the lower permanent farms of Potthoff's study area, allowed the sale of milk to processing units which fetched higher prices than the butter produced on the high altitude summer farms.

Economic competitiveness is placed at the core of European rural development policy. The primary means to achieving this is the restructuring and modernisation of the

agricultural sector. Diversification away from agricultural production is the focus for increasing economic activity and employment rates in the wider rural economy. The focus on modernisation and restructuring gives the implicit signal that modes of production that have less potential to be economically competitive (even though they deliver public goods) have an uncertain place in the European model of agriculture. The inclusion of the 'preservation and development of high nature value farming systems' in the recent community strategic guidelines for the 2007-2013 rural development programme would seem to be a step towards the recognition of the non-economic benefits that farming can deliver. However, this is a piecemeal approach considering the potential of HNV farming systems, when adequately supported, to produce artisan products, sustain communities in rural areas and to conserve natural and cultural heritage.

In a comprehensive review of the industrial modernisation of farming in Austria over the last 200 years, Krausmann (2004) has illustrated the transformation of agriculture from providing society with primary energy to 'becoming an energy consuming provider of food'. Netting (1993) and Douwe van der Ploeg et al (2000) provide empirical data to question the efficacy of pursuing ever increasing economies of scale in agricultural production giving examples from the Netherlands and the United States. They both highlight the ability of smaller sized farms to be more diversified and to produce rates of returns comparable, with fewer inputs, to the largest of agri-businesses. High nature value pastoral systems need to develop to avoid the creation of farming 'museums' (Jones, 2007) and the avoidance of perpetuating poverty in the process of conserving biodiversity. However, there will be limits to the economic competitiveness of pastoral systems in comparison to industrial forms of livestock production. Adequate support should be directed their way in acknowledgment of their importance in maintaining populations in remote regions, in the production of artisan products and in the conservation of natural and cultural heritage.

The third axis of the EU rural development programme contains several measures designed to stimulate the creation of employment in rural areas. Accordingly, in Romania, axis three measures encouraging the development of micro-enterprises, and the encouragement of tourism activities aims to create, respectively, 23 596 full time jobs and 33 493 net additional full time equivalent jobs. However, these targets, whilst important, are low relative to the 9.7 million people living in rural areas in Romania (10: RMARD, 2007). Likewise, the numbers of holdings that can receive financial support through rural development measures are considerably less than the current number in existence. The LFA measure for mountain areas will support up to a total of 200 000 holdings, less than a quarter of the 800 000 occurring in these regions at present. For all three AEMs (grassland conservation, organic farming and soil and water protection) up to a total of 63 786 holdings will be supported. A transitional measure specifically supporting semi-subsistence agricultural holdings, available only to Bulgaria and Romania, provides financial assistance to orientate holdings currently producing for home consumption towards producing for the market. In Romania, this measure will support up to a total of 95 215 holdings with the target of 76 172 holdings entering the market during the 2007-2013 period. This latter figure equates to less than 1% of the 3 735 910 holdings in Romania that are less than 5 hectares. These figures suggest that the resources available to support low-intensity farming systems and HNV pastoral systems in the mountain regions are limited relative to their current extent.

The Romanian government is, however, making efforts to make exempt pastoral production systems from EU legislation that would otherwise jeopardise their future. In Moeciu de Sus, tourists buy cheese directly from producers on an ad hoc basis either from a road side seller or through enquiry at a guesthouse. It is also common for villagers to make up shortfalls in their own production of milk or cheese by buying from others in the village. Most people buy from the families that specialise in sheep production and who rent the communal or private pastures. EU hygiene regulations will not apply to food that is produced for home consumption or small quantities of primary products. However, it will be necessary to gain authorisation from the Veterinary Health

Directorate for the sale of secondary products, including cheese (POA Association, 2007). During fieldwork in 2005, shepherds and villagers expressed concern that they would be unable to continue making cheese in shepherd camps because European Union hygiene legislation would not permit this. These fears would, in theory, appear to have been needless as shepherds are able to apply for dispensation by registering their produce as traditional. On paper, the registration procedure for traditional products would appear to be straightforward and requires little further effort than the standard registration procedure for the sale of secondary products. This approach would also valorise the product on the basis of cultural heritage but could also be tied in to the conservation of natural heritage. This would necessitate the provision of clear and reliable messages to consumers so that they are able to distinguish between the many labels that are already in existence. The POA Association advise that the registration of traditional products might also prevent more commercial enterprises capitalising on the brand of artisan products.

The concept of ecosystem services, the benefits that humans derive from the functioning of ecosystems (e.g. climate regulation, water regulation and nutrient recycling see Costanza et al, 1997) is filtering through to the development of European policy. A significant proportion of future agricultural incomes will be derived from payments ensuring the continued provision of ecosystem services (Parliamentary Office of Science and Technology, 2006). Biodiversity can be viewed both as a service in that it is critical to the health of ecosystems for instrumental reasons, (e.g. the pollination of crops) and as being important for intrinsic reasons. However, it has proven difficult methodologically, and a matter of some controversy (Gowdy, 1997), to ascribe market values to the less tangible and intrinsic benefits of biodiversity. Nevertheless, an ecosystems services approach might direct more support to pastoral modes of production in recognition of their importance in maintaining biodiversity and in producing food in a comparatively energy efficient process. This approach could raise the status of pastoral production systems and strengthen the justification for directing support to HNV farming systems thus avoiding the creation of anachronistic farming museums or nature

reserves. An ecosystem approach could also potentially join-up rural development and rural land-use policies. It is critical that those charged with developing nature conservation policies for farmed land attempt to understand the holism of the farming system so as to formulate policies that can realistically support the socio-economic viability of the production system without jeopardising cultural and natural heritage.

Self-perceptions and status

In contrast to Viazzo's (1989) description of mountain farming work being beneath the men of the village of Alagna, there is very little to suggest, as already mentioned, that there is stigma associated with working the land in Moeciu de Sus. A woman recounted an exchange that she had had with a tourist from the city: "hey lady, your cows smell really bad" to which she replied "yes but you like to eat the cheese don't you". She laughed at the ignorance of the tourist and at their squeamishness when faced with the reality of food production. The fact that most people in the village, even the more affluent, still maintain a smallholding ensures such robust attitudes towards the perceptions of tourists. The income from tourism is welcomed by the villagers but the trade-off that this has entailed in terms of a perceived decline in the peacefulness of the settlement and the uncontrolled development in the valley floor is acknowledged. It has also created a pressure on households to renovate their houses.

Whilst there is little snobbery connected to the productiveness of smallholdings, there is a strong pressure to keep up with the neighbours in terms of modernising houses. Conversations often centre on who is renovating their house and how many additional rooms they are creating. In this respect, the modernity and number of rooms in a house is being used as a measure of the prosperity of a family. The maintenance of a smallholding may therefore come to be seen to be a mark of a household that is not prospering, particularly if some families in the village pursue the commercialisation of production. The sale of land already indicates a division in the attitudes of households

towards smallholding work. The willingness of some households to sell parcels of lower ground to cash-in on the popularity of the area as a tourist destination contrasts with families that rejected this option as a means of raising capital. The more conservative families express the opinion that the money raised through the sale of land soon disappears and then you are left with a diminished holding. An older man made reference to the guidance of the local church on this issue. The church council rejected a proposal to sell ecclesiastical land reasoning that it is not theirs to sell but is there to be preserved for future generations. This belief is often staunchly held on to even when a family faces unexpected financial difficulties. A woman whose husband received severe injuries in a car crash and who struggled to meet the cost of resulting medical treatment was incredulous when another villager suggested that she should sell some land to pay her bills. The people that prefer not to sell land are less likely to question whether or not they will continue to run a smallholding in the future. The smallholding is a constant in their life and has been used as safety net to support the household in recent years and in generations past and should be passed down to younger members of the family for the same purpose.

The uptake of voluntary agri-environment schemes might be higher amongst households that express notions of stewardship with regards to their land. Burton (2004) has described the resistance of farmers in the UK in entering into voluntary measures on the basis of 'an anticipated loss of identity or social/cultural rewards traditionally conferred through existing commercial behaviour'. Burton's research concerns 'post-productivist' agriculture, a label that denotes the move away from the single concern of increasing yields (productivist agriculture) towards the inclusion of environmental objectives. Smallholders in Moeciu de Sus might be termed pre-productivist using this categorisation. As a semi-subsistent system, the motivation of production, in general, is to provide for the needs of the household not to ensure profit. Yields of hay and milk are important in terms of securing sufficient winter fodder, milk and cheese but the maximisation of yields is not a measure of a 'good' smallholder. In this respect, there will not be a resistance to AEMs in the sense that Burton describes. The promotion of

smallholdings as producers of traditional products and as conservers of both cultural and natural heritage might result in the social/cultural rewards that Burton suggests can be conferred on farming practices and might help to avoid the perception that this type of production is anachronistic and embarrassing.

The identification of the social and cultural dimensions that contribute to farmer's attitudes in relation to their land and modes of production could also help to anticipate possible areas of conflict. Opposition amongst Finnish farmers to the top down implementation of the Natura 2000 designation process partly stemmed from notions of the independence of land ownership (Siebert et al, 2001). Sikor (2005) corroborates this example with case studies from central and eastern Europe and illustrates how, to landowners, property means more than the legal entitlement to the land. It can also comprise symbolic and material meanings founded on ideas of historical justice. This can result in landowners contesting values that are portrayed as being representative of the 'national' interest. Environmental values, he argues, can be less important to property owners and local officials than rural and agricultural economic development. He illustrates, with a Polish case study, the intersection of interests between land owners wanting to 'cash-in' by selling agricultural land for development with the interests of the government which places priority on economic development. With an example of hay meadow conservation in the Czech Republic, he cautions that although land owners may be keen to benefit from subsidies, they may be less willing to accept the conditionality of the payments, if the environmental services that they are being paid for are not seen to be representative of public interest, in this case, economic development.

Summary

Wallies de Vries et al (2002) state that 'the challenge of the future clearly is to arrive at an integration of conservation at the level of the species, level of communities and level of processes'. This statement is made with respect to the conservation of remnants of

calcareous grasslands in north west Europe where the pastoral practices that created and sustained these habitats have become obsolete. In Romania, pastoral production systems, as demonstrated by this research in Moeciu de Sus, meet the requirements of species and plant and invertebrate communities and, although not investigated here, maintain ecological processes. The challenge in Romania is to develop ways to support the social and economic viability of pastoralism and by doing so, increase the attractiveness of pastoral livelihoods. The species of semi-natural grasslands can only be effectively conserved by pastoralism. Agricultural biodiversity is rarely sustained over sufficient spatial scales by conservation management.

High nature value farming systems may be economically marginal but they can also be 'socially valued and historically embedded' (Small, 2003). People should not have to choose 'between development and their own traditional culture, because the latter can adapt' (Douglas, 2000). 90% of agricultural land in Romania was collectivised into state or cooperative farms during communism. For this reason, it is to be expected that literature on agrarian change focuses on decollectivisation and the challenges that the 'massive return to peasant farming' poses to developing an economically competitive agricultural sector (Veres, 1999; Rizov et al 2001; Swain and Vincze, 2001; Sabates-Wheeler, 2002). However, as Small (2003) emphasises

'The challenge to researchers of agrarian change [in central and eastern Europe] is to recognise the holism inherent in agrarian systems, and the assumptions embedded in traditional Western thought'

With the exception of Rey (1985, 2001) and Brinkmann (2006) there has been little research into the development and support of livestock production in the mountain areas of Romania.

The primacy of economic competitiveness in the EU rural development programme for the period 2007-2013 leaves the role of smallholding based agriculture in the Romanian

uplands in question. Douwe van der Ploeg (2000) asserts that, in the Netherlands, 'the modernisation development model is not only out of step with the expectations of society but that, it is only supported by a minority of the agrarian community'. In Romania, it is possible that there may be much more support for modernisation given the economically parlous state of production on land that was formerly farmed at a much more intensive level. However, the appropriateness of the drive for profitable production should be questioned for every holding in every location, particularly in the mountains where economic competitiveness is unlikely to be achieved and where the conservation of biodiversity is dependent upon the continuation of pastoralism. Rural development programmes need to recognise that 'heterogeneity is intrinsic to rurality' (Douwe van der Ploeg and Rooij, 1999). Heterogeneity can also be a feature within categories of agricultural systems. Viazzo (119: 1989) recognised that: 'Alpine communities could differ very markedly from one another and that no single model [of cultural anthropological theory] is likely to do justice to their economic, social and cultural diversity'.

There is an urgent need to generate information on the variety of high nature value farming systems that exist in Romania. The case study approach can prove useful for demonstrating the ecological relationships between pastoral land-use practices and the biodiversity of semi-natural grasslands. It can also allow a contextual and more holistic analysis of the functioning and organisation of pastoral systems. This will allow the identification of factors that threaten the social and economic viability of these more economically marginal forms of agricultural production. From this basis, rural development measures can be designed and implemented with the intent of supporting the social and economic viability of high nature value farming systems.

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Conclusion

Conclusion

The low-intensity management of hay meadows by pastoral smallholders in Moeciu de Sus maintains a high diversity of butterfly species. In Moeciu de Sus 700 hectares of hay meadows are divided into hundreds of small individual parcels managed by more than 230 households. The subtle differences in the low-intensity management of individual meadows (timing of mowing, level of dunging and grazing) in combination with spatial variations in edaphic factors introduces heterogeneity into the vegetation of the hay meadow habitat. This heterogeneity is important in supporting the often contrasting ecological requirements of a diverse range of butterfly species. For example, the ordination of butterfly data indicates the importance of late mown meadows, recently abandoned meadows and unmanaged rocky calcareous grasslands in providing habitat for the adults of butterfly species that emerge later in the summer.

The results of this research indicate that an intensification in meadow management practices would lead to a depauperate butterfly fauna. This finding justifies the prohibition of increased levels of fertilisation on land that is entered in to agri-environment agreements or on land that falls within the boundaries of Natura 2000 sites. Though not investigated here, the abandonment of meadows will also, in the long-term, result in the decline of plant and butterfly species associated with semi-natural grasslands. The abandonment of hay production in Moeciu de Sus is a more likely scenario than the intensification of land use practices. The intensification of land use in the area is primarily limited by the steep and relatively unproductive terrain.

This research has highlighted how the biodiversity of hay meadows in Moeciu de Sus is indirectly dependent upon the removal of livestock from the smallholding in the summer months to pastures where they are communally herded by hired shepherds. The organisers of the communal grazing are finding it very difficult to find skilled shepherds to employ. Men are leaving the profession for jobs which provide better working conditions. It is also probable that younger generations in Moeciu de Sus will also

abandon the smallholding element of their livelihood strategies as the economy of Romania develops and removes the necessity for semi-subsistent production. In the short-term, cultural 'brakes' will slow the rate of smallholding abandonment as older generations will be slow to relinquish land-use practices that have ensured the survival of the household in difficult times. In the medium and long-term, however, the agri-environment measure targeting semi-natural grasslands will be insufficient to maintain the social and economic viability of pastoral livelihoods. The conservation of semi-natural grasslands in Romania is dependent upon the continuation of socially and economically viable pastoralism.