The threat of abandonment in socio-ecological landscapes: farmers' motivations and perspectives on high nature value grassland conservation

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Abstract

Future sustainability of the conservation management of socio-ecological landscapes is typically reliant on on-going agricultural management. Such management may be threatened by changes in the drivers of management and the fragility of the stakeholder networks that deliver management. This study examined evidence for the risk of abandonment in a series of case study high nature value (HNV) grassland sites. The work found that the motivation of farmers to participate in the conservation management was typically limited and often marginal. Landowners and conservation stakeholders who relied on partner farmers to manage such sites often struggled to recruit and retain their help, leading to intermittent turnover in managing farmers and to some sites being under-managed. A trend towards greater financial incentivisation of farmers was evident, which policy-makers responsible for agri-environment schemes should note, and elsewhere some conservation organisations were seen to be bringing grassland management in-house. Primary reasons for farmer turnover and difficulty of recruitment included a lack of candidate farmers in the local landscape, and the marginal and fluctuating economics of grassland management. Farmers' motivations to participate in conservation management of such systems may continue to weaken and abandonment may therefore become a significant risk to the successful conservation of such systems. Conservation stakeholders need to foster good relations with their farmer-manager partners and not further depress their limited motivations to participate, as well as consider carefully whether farmer stakeholders are being adequately compensated for their efforts.

Highlights

- Abandonment is a key risk to the management of some socio-ecological landscapes
- Risks result from the difficulty in recruiting and retaining managing farmers
- Farmers' motivations to participate are limited by marginal economic benefits
- Trend towards increased financial incentivisation of farmers to improve retention

Keywords: species-rich meadow, agri-environment scheme, hay cut, grazing management, grassland management, economic benefits.

Introduction

Socio-ecological landscapes[1] consisting of high nature value (HNV) grasslands valued for biodiversity require the continuation of the traditional land-management practices that created them in order to be conserved into the future (Losvik, 2003; Fischer et al, 2012). Yet worldwide, changes in agricultural practices are leading to the abandonment of grasslands as a result of social, economic, cultural and historical factors (Scanga and Leopold, 2012; Babai and Molnar, 2014; Beilin et al, 2014; Joyce, 2014; Sharma et al, 2014; Lieskovsky et al, 2015).

Particularly for European landscapes, a large proportion of which are diverse forms of grasslands, and many of which are highly valued for biodiversity (Habel et al, 2013), researchers have emphasised the importance of the continuation of traditional management (Bignal and McCracken, 1996; Isselstein et al, 2005; Schmitt and Rakosy, 2007; Bezak and Halada, 2010; Krause and Culmsee, 2013; Birge and Herzon, 2014; Molnar, 2014), the threat of abandonment of such practices and the potential loss of associated traditional ecological knowledge (Hopkins and Holz, 2006; Prince et al, 2012; Babai and Molnar, 2014).

Across Europe too, changes in agriculture are leading to farmland abandonment to varying degrees (Young et al, 2005; Keenleyside and Tucker, 2010; Rewilding Europe, 2012; Habel et al, 2013; Wild10, 2013). Whilst Keenleyside and Tucker (2010) note that the trend is strongest in parts of Southern and Eastern Europe, and that the threat of farmland abandonment is generally weaker in Northern and Western European countries such as the UK, they also note that semi-natural and extensive grassland landscapes are particularly at risk of abandonment. Such abandonment would be likely to lead to a rapid loss of the type of biodiversity for which they are valued in this region, where grasslands commonly constitute early successional stages in the native vegetation (Joyce, 2014).

Following this loss of value, intensification could potentially then follow in some instances in the longer term, where restoration work cannot be funded. Such restoration work requires funding over time and can be a lengthy process (MacDonald, 2001). Drivers of the loss of HNV grasslands have varied spatially and temporally but Rodwell et al (2007) note that for some, abandonment may well prove to be the most significant threat.

Literature regarding the impact of abandoning traditionally managed agricultural land on biodiversity is extensive. However, less common are studies of the drivers of such abandonment, with much of the existing literature focussing on Eastern Europe and upland areas of Central and Alpine Europe, and less covering the risk of the abandonment of HNV grasslands in lowland Northern and Western Europe, where much loss has often been the result of agricultural intensification (Woods, 2011).

Factors noted as driving abandonment of traditionally managed agricultural lands in Europe include a broad range of biophysical and socio-economic factors. Social factors include changes in rural demography, society and culture (ADAS, 1993; Crofts and Jefferson, 1999; Lieskovsky et al, 2015). Economic factors include barriers that act as disincentives and competition from intensification, as well as financial incentives such as agri-environment schemes that may compensate for low productivity under different farming conditions. Jitea and Arion (2015) and Graf et al (2014)

[1] co-produced by the interaction of biophysical and social processes

highlight the importance of such subsidies in supporting traditional agriculture. Other practical and biophysical factors cited in literature include topography, soil quality and remoteness of land from human settlements (Lieskovsky, 2014; 2015; Jitea and Arion, 2015), which in turn interact with social and economic drivers.

In some countries, traditional and low-intensity conservation-orientated farming is supported by agri-environment schemes, funded for example in Europe from the European Union (EU) Common Agricultural Policy and from other budgets of EU Member States (European Commission, 2012; 2015). Such schemes are intended to incentivise the management of sites such as HNV grasslands, by providing compensation where a financial disadvantage is incurred by the low-intensity management and corresponding low productivity. Balanced against this, any factor that acts to make management more difficult, inconvenient or unattractive to farmers, and which are not perceived to be adequately compensated for, may affect the sustainability of grassland management and threaten the ability to maintain sites in good condition. Given the lack of emphasis in current literature on the drivers of grassland abandonment, especially in Northern and Western Europe, the threat of abandonment of HNV grassland appears to represent a gap in our knowledge.

A significant proportion of European high value socio-ecological sites are grasslands, and of these, lowland species-rich floodplain meadows are considered to be of European importance. They now constitute a rare landscape in Europe, highly valued for their species-rich sward, the rarity of their grassland assemblages[2] (Ellenberg, 1988; Rodwell, 1992), and in some cases for the presence of rare plant species such as the snakeshead fritillary *Fritillaria meleagris* (Jefferson, 1997; Horton and Jefferson, 2006; Rodwell et al, 2007; JNCC, 2007). Good examples are now deemed of international importance for nature conservation at the European level and five of the largest sites in the UK have been designated as Special Areas for Conservation (SACs) (European Commission, 1992, 2007), with most of the remaining known sites notified as Special Sites of Scientific Interest (SSSIs) (Nature Conservancy Council, 1989; JNCC, 2007).

The key drivers that influence the floristic composition of such floodplain meadows are well known and researched, and include the hydrological regime, the mesotrophic soil nutrient conditions and nutrient flows associated with river silt delivered by flooding patterns, and the meadow management regime (Mountford et al 1993, 1996; McDonald, 2001; Gowing et al, 2002, 2005; Crichley et al, 2007). The broad lines of traditional meadow management regimes and the impact of particular management operations on the grassland sward and species composition are also well-known and researched (Benstead, 1997; Crofts and Jefferson, 1999; McDonald, 2001; Gowing et al, 2002). The management regime broadly consists of a hay cut in late spring or early summer, followed by aftermath grazing in the autumn, usually with cattle.

The aim of this paper is therefore to assess the risk posed to the conservation of HNV grasslands by abandonment. A case study approach is taken to examining a series of high nature value (HNV) grassland sites, in order to answer the following questions: what views and perspectives are held by farmers actively involved in grassland-management delivery regarding grassland value and management and what impact do these views and perspectives have on farming stakeholders'

[2] *Alopecurus pratesis-Sanguisorba officinalis* grassland, community MG4, as defined in the UK National Vegetation Classification (NVC; Rodwell, 1992) and Habitat type 6510 in Annex II of the EU Habitats Directive (European Commission, 1992).

motivations to be involved in grassland management?; what other factors undermine or enhance such motivation? and crucially; what is the resultant impact on the risk of abandonment of meadow management? In answering these questions, this paper aims to evaluate the risk of abandonment of HNV grasslands and thereby contribute to debates on how to mitigate such risks.

Methodology

In order to address the above research questions, the views and perspectives of farmers actively involved in the management of a series of high nature value floodplain meadows in Lowland Central and Southern England were explored in detail (Table 1 and Map 1) using a case-study strategy (Yin, 2014) and semi-structured interviews (Longhurst, 2010). Most work on semi-natural grasslands, and floodplain meadows in particular, has focused on the biophysical processes that produce them, with much less work having been done on the social processes that influence their production through site management. Such processes are influenced by social, economic and cultural factors that have been much less explored and that often require, at least initially, a more qualitative approach to their investigation, in order to identify and explore key issues influencing meadow management.

This work was focused on the association between the subjective perspectives, attitudes and motivations of farmers and other stakeholders involved in meadow management, and the risk of grassland management abandonment. It was necessary therefore to shed light on the meaning and value that floodplain meadows represent for farmers and associated other stakeholders in the meadow managing network, on their understandings of the meadows' place in the landscape, as well as to shed light on the purpose that conservation of such sites serves for such actors in society. The work was also therefore exploratory in its desire to examine and identify a wide range of factors and influences and needed to be open-minded in its perspectives.

The research strategy was therefore designed to provide in-depth knowledge of particular case studies as a broad survey would yield a large volume of superficial data that would not be sufficiently detailed to address the research questions. Three meadows were studied in detail (Case Studies 1-3, Table 1: North Meadow, Brook Meadow and Long Mead) to obtain rich data on these specific cases, with which to generate detailed understandings about the complex issues involved. In addition, a further six meadows were studied to a lower level of detail in order to provide data against which to test the findings from the main case studies in order to improve the generalisability of any findings. It was considered therefore that the above approach would provide a balance between the depth and breadth required to allow any conclusions to be representative of the broader picture.

Table 1 – Case study meadows examined during the research (see also Map 1)

Case study number (Map 1)	Meadow name	Location	Latitude, Longitude	Area (ha)	Conservation designations
1	North Meadow	Cricklade, Wiltshire	51.651, -1.865	44.4	SAC, NNR, SSSI
2	Brook Meadow	Darley Green, Warwickshire	52.367, -1.736	1.73	SSSI, CWS
3	Long Mead	Eynsham, Oxfordshire	51.775, -1.363	10.5	CWS
4	Mottey Meadows	Wheaton Aston, Staffordshire	52.718, -2.238	44.6	SAC, NNR, SSSI
5	Portholme	Huntingdon, Cambridgeshire	52.322, -0.184	104	SAC, SSSI

6	Oxford Meads (Pixey and Yarnton)	Wytham/ Cassington, Oxfordshire	51.792, -1.305	86.9	SAC, SSSI
7	Sherbourne Meadows	Norton Lindsey, Warwickshire	52.254, -1.646	21.5	SSSI
8	Birches Barn	Polesworth, Warwickshire	52.616, -1.584	10.7	SSSI
9	Deans Green	Ullenhall, Warwickshire	52.312, -1.808	4.9	CWS

SAC = Special Area for Conservation; SSSI = Special Site of Scientific Interest; NNR= National Nature Reserve; CWS= County Wildlife Site[3]

The case studies were selected to represent a degree of geographical spread across the region in which most meadows are located, as well as a range of conservation designation status, from high-profile internationally-protected SAC sites to lower-profile non-statutory CWS sites (see Table 1 for definitions). However, it did not prove possible in this study to include meadow sites with no conservation stakeholder involvement at all, as the owners of such sites that were approached declined to participate[4]. The situation regarding such meadow sites remains in question and should form the focus for future work.

[3] SAC is an international statutory nature conservation designation of the European Union, SSSI and NNR are statutory designations of the UK Government, and CWS is a non-statutory designation used in English local government for spatial planning purposes.

[4] Landowners may have been concerned that research could lead to statutory designation of their land and possible loss of control over management. One Natural England Conservation Officer commented that some landowners are indeed unhappy about the designation of their land for nature conservation purposes (personal communication, Natural England Conservation Officer, Warwickshire, UK, 20/01/2011).

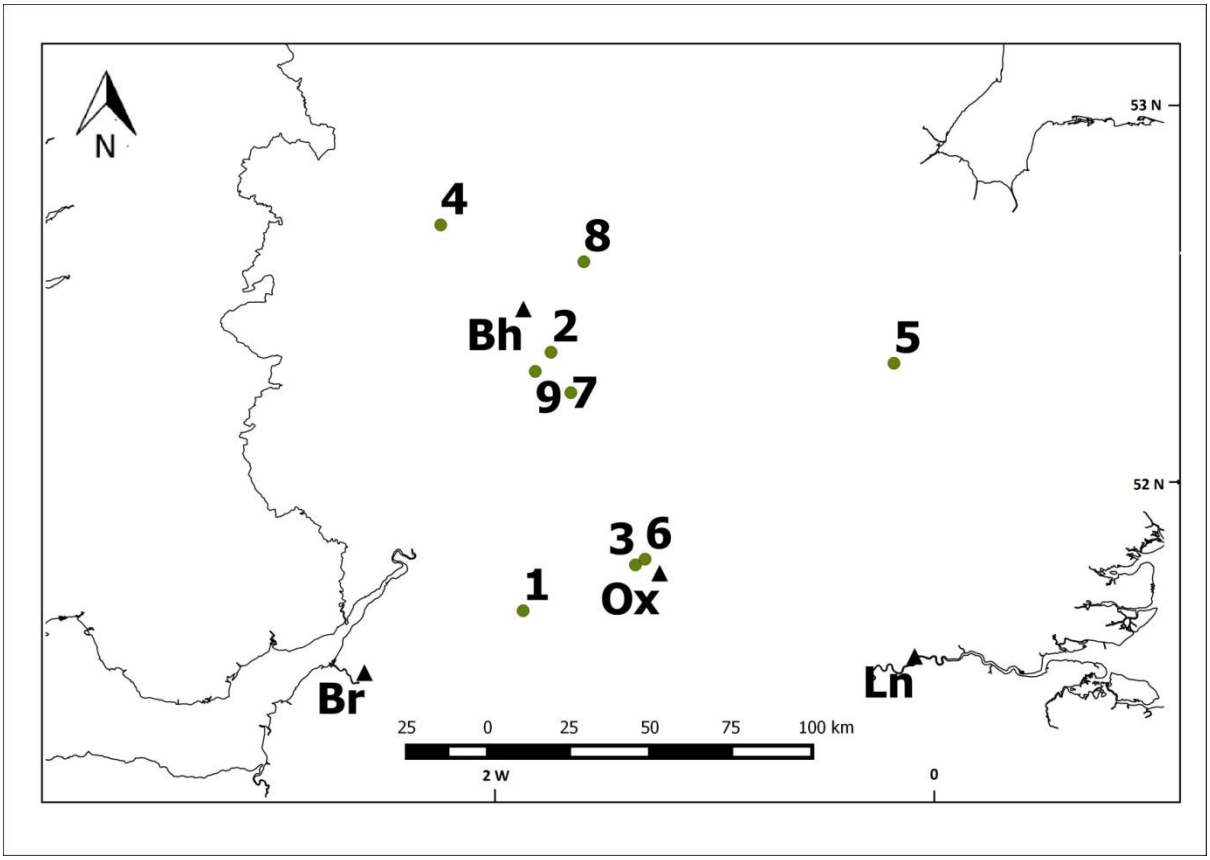

Figure 1 – Location of the case study floodplain meadows examined in this research (circles - site names given in Table 1). Triangles: nearest major cities (Ln=London, Br=Bristol, Bh=Birmingham, Ox=Oxford). McGinlay, James, GB National Outlines [SHAPE geospatial data], Scale 1:250000, Tiles: GB, Updated: 8 June 2005, Ordnance Survey (GB), Using: EDINA Digimap Ordnance Survey Service, <http://digimap.edina.ac.uk>, Downloaded: November 2014.

Stakeholders involved in meadow management were identified through a review of literature and websites, and through discussion with key gatekeepers, such as Natural England[5], Wildlife Trusts[6] and the Floodplain Meadow Partnership, a research consortium hosted by the Open University, Milton Keynes, UK. Semi-structured interviews were then used to confirm and clarify the role of each managing stakeholder and farmer identified, as well as to identify via snowballing any further significant actors involved in meadow management, who had not been previously identified.

Stakeholders' views, perspectives and motivations were collected using semi-structured interviews. The interviews were semi-structured in order to obtain data on specified topics, yet allow the interviewee scope to express themselves and reveal the issues that they felt were important, and to clarify and contextualise their responses. Some questions were also not relevant to all stakeholders, but a range of questions were asked concerning several main areas:

- Interviewee's history of involvement with the case-study meadow and knowledge of the site's past history
- Motivation and interest for involvement in the management of the meadows

[5] Government agency responsible for statutorily designated nature sites in England, and administering agri-environment schemes.
[6] Nature conservation charities

- Opinions on the valued characteristics of the site and whether it is worth retaining in its present form rather than changing to a new use
- Opinion on what constitutes a 'good' or 'bad' meadow or meadow condition
- Assessment or evaluation, formal or informal, that the stakeholder undertakes of meadow condition, status or management
- Management operations that the stakeholder is involved in with the meadow
- Factors influencing decisions about management operations, and whether the outcome of assessments influences the operations
- Interactions with other stakeholders (extent and whether these were positive or not)
- Any records that the stakeholder kept of assessment or management activities
- Personal opinions and perspectives on the current state and management of the meadow at present and in the future

Some flexibility had to be exercised in conducting the interviews in order to accommodate the different priorities and perspectives of the interviewees, but always with the intention of covering the above areas.

The semi-structured interviews characterised the role of each stakeholder in the meadow managing network, the activities they undertook, the decisions they made, if any, regarding the management activities and the factors influencing or constraining farmers' scope for action. In this way, constraints on their agency to manage the meadows as they would prefer were explored, including any disputes between the farmers and conservation-orientated stakeholders, such as government agencies or Wildlife Trusts (nature conservation charities), which might impact on the farmer's view of meadow value and motivation to participate in meadow management.

Interactions between stakeholders were also investigated, as well as formal structures and processes such as the requirement to request permissions to undertake certain activities such as the hay cut, or regard shown to formal documentation such as management plans or agri-environment agreements. Stakeholders were asked about their views, feelings and experiences with regard to their respective roles in the meadow-management network, and about their view of their personal agency, scope for action and decision-making. The role, if any, of funding mechanisms was noted in compensating for any negative impact that such constraints might have on their motivations in order to assess the extent to which these may or may not incentivise farmers to continue participating in meadow management.

As well as practical motivational factors, more personal and affective factors were also explored, such as the farmers' broader ideas and perspectives about meadow value, their sense of the meaningfulness of meadow conservation and broader motivations for participation. This approach allowed a fuller exploration of the influence and balance of motivational and demotivational factors on their views of meadow value and their interest and enthusiasm for participating in meadow management.

Where participants consented, the interviews were recorded using a portable digital voice recorder to permit careful analysis of the transcript. In all cases hand-written notes were also taken. Following interviews, notes were made of the interviewees' responses as soon as possible, organising the information into a template, based on the research components and sub-questions.

This provided a standard structure that permitted cross-comparison of answers and opinions between different stakeholders for the same site and between sites.

In total, 53 semi-structured interviews were conducted with 44 stakeholders between March 2010 and December 2012, including 22 interviews with 16 farmers, 21 interviews with 19 other case-study-specific stakeholders with an interest in meadow management, and a further 9 interviews with regional and national grassland conservation specialists from organisations including Natural England, centre for Ecology and Hydrology, Thames Valley Environmental Records Centre and Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust. Where quotations are provided in the text, these have been anonymised to protect the identity of the interviewee.

Results

The stakeholder networks managing the case study sites were unique to each meadow but generally comprised three essential groupings: landowner, conservation organisation or conservation-interest party, and farmer/land manager or other agricultural-interest party. One such entity might fall in to more than one grouping, but at least two such entities were identified at each site. For the purposes of this analysis, the stakeholders involved in managing the case study floodplain meadows have been divided into two broad groups: conservation-orientated stakeholders whose primary interest is nature conservation, and farmer-managers whose interest is primarily agricultural. This said, these two broad groups in reality represent a spectrum of views, perspectives and interests, which overlap to some degree. The landowner could fall into either group. Generally, large sites tended to have more stakeholders involved, with for example several hay farmers and a separate grazier. Most inter-stakeholder relationships consist of a primary one-to-one relationship between the conservation stakeholder or responsible landowner and each managing farmer.

Candidate availability

At most meadows, conservation-oriented stakeholders experienced some degree of difficulty in recruiting and retaining farmers to undertake the agricultural management operations. Challenges noted were two-fold: firstly the difficulty of replacing farmer partners where the incumbent retired or ceased involvement for other reasons, and secondly the associated issue of demographic changes relating to an ageing farmer population approaching retirement.

North Meadow was not adequately grazed for nearly 10 years between 2001 and 2009 as a suitable cattle grazier could not be found in the local landscape. As noted by the Hayward[7] and by elderly residents of Cricklade interviewed for an oral history of the meadow (Snakeshead Revisited Project, conducted by the Cricklade Manorial Court and supplied by Natural England) this contrasts with the larger herds of cattle that would have grazed the meadow historically. Interviewees for the oral history noted that, in their recollection, for at least the second half of the twentieth century, farmers with large farming operations such as large cattle herds had not been interested in the meadow as a resource. The meadow had in the past been of interest to small-scale farmers and it is precisely these smaller farming concerns that have been disappearing from the landscape.

Similarly, at North Meadow the hay cut is delivered through a long standing licensing arrangement. At the time of the fieldwork (2010-2012) the meadow hay was cut by three farmers, two of whom were past retirement age and one of whom has since died, the hay cut being then shared between the two remaining farmers. As regards demographics, the meadow hay cut appears therefore to be susceptible to the demographic factors of an ageing farming population, as noted above.

The Natural England site manager for one of the other large internationally-designated SAC meadows noted that the greatest concern regarding meadow management was that the managing farmers would no longer wish to be involved in the meadow management, as they would be difficult to replace. Other meadows were also noted to have suffered periodic farmer turnover including Sherbourne Meadows, Brook Meadow and Deans Green in Warwickshire, and Oxford Meads in Oxfordshire. The Oxford Meads is a large area of meadows near Oxford (87 ha) with complex and

[7] traditional post appointed to oversee the meadow grazing

fragmented land ownership, much of which had had inconsistent management until an umbrella arrangement was brokered by the government agency, Natural England for the entire complex to be managed under contract by one land-management company. Sherbourne Meadows in Warwickshire were reported to have been managed by the same family for approximately 100 years, followed by another farmer for approximately 10 years. At the time of fieldwork (2011) it was being managed by a new farmer for the first year.

At Brook Meadow, the land-owning Wildlife Trust[8] staff noted the difficulty in finding farmers to manage the meadow and saw it as vulnerable in terms of the provision of future management. Trust staff also cited the ageing farmer network as an issue, noting that most reserve farmers were over 60 and:

> If they have no family to take over where will we be in ten years time? Relationships are individual and we don't know who is over the hedge in terms of the broader landscape[9].

Farmers' ideas and perspectives on meadow value

The views of farmers interviewed on meadow value varied and could not be stereotyped. They generally held broad holistic views of the value of traditionally managed floodplain meadows. These typically encompassed an appreciation of the non-agricultural aspects of meadow value, which they either shared with conservation stakeholders or at least acknowledged as valid, even if they did not strongly share the conservationists' view of meadow value. They therefore commonly acknowledged the validity of biological, cultural and landscape aspects of meadow value. One farmers noted that he was happy to manage a meadow for either agricultural or non-agricultural goods and services. Indeed two hay farmers professed to enjoy the traditional hay-making process from an aesthetic perspective, whilst another described the meadows as being equivalent to listed buildings.

The farmers generally placed the agricultural value of the meadows in a prime position of importance, in line with the findings of Kleftoyanni et al (2011) and of Riley (2006). It was hay quality, hay quantity and convenience of management that were of key importance to farmers. Those that did not rely strongly on the income from managing the floodplain meadows acknowledged that they felt able to enjoy the non-economic aspects of meadow value because they had diversified incomes and limited dependence on the meadow for income. Had they been more dependent on meadow income, they thought that they would have to be more focussed on the meadow as an agricultural resource. This accorded with the views of the Natural England conservation officer who administers the agri-environment scheme for one Oxfordshire meadow, and who noted that many of her private landowning clients liked their conservation meadows and wanted to keep them, but that this hinged on the continuation of government support, without which her clients would need to focus more on the economic output from the meadows. As regards the divergence of the rationale behind conservation and commercial farming (Crofts and Jefferson, 1999), one farmer noted for his meadow:

> As a farmer, it's totally useless. As a conservationist, it's a real treat. I'm really torn.

[8] nature conservation charity

[9] Personal communication, Warwickshire Wildlife Trust officer, Coventry, Warwickshire, UK, 30/3/2011

Barriers to farmers' agency in meadow management

As convenience of management in fitting in with farmers' other work is a key issue for hay farmers, farmers' agency to make decisions about management operations, such as the timing of the hay cut or intensity of grazing, are therefore likely to influence their view of meadow value and of any management restrictions imposed by conservation stakeholders.

For example, the hay cut is constrained by a start date before which the hay may not be cut, typically mid-July, imposed on sites with a statutory nature conservation designation through their management plan, or on sites where management is funded through an agri-environment agreement and the hay-cut start date is cited in the agreement. These restrictions are reported in management plans and by conservation stakeholders in interviews to relate to the need to allow ground nesting birds to fledge and plants to set seed. The impact of the restriction, which varies from site to site, is that farmers perceive a reduction in hay quality to result from this restriction, thereby reducing its utility and value to them. The restriction also narrows the window of opportunity for farmers to fit the hay cut in with their other work at a busy time of year. The effect has been a generally negative impact on farmers' views on meadow management, with hay farmers at most of the case study sites expressing the desire to cut the hay earlier.

Similarly, disputes exist about the validity of fertilisation of meadows by manuring, which conservationists wish to restrict, though not necessarily prohibit as a potentially damaging operation. Some farmers such as the hay farmers, particularly at North Meadow and Mottey Meadows, viewed this as a traditional farming practice without which the meadows would change materially, particularly in terms of falling yields. Rolling or harrowing were also considered by many farmers to be traditional practices that again improve sward performance in terms of their criteria of meadow value, but which conservation stakeholders again restrict or prohibit as potentially damaging. Again, some farmers were sharply critical of such restrictions. Evidence from the case studies suggests that these operations (manuring, rolling and harrowing) are indeed very rarely undertaken on floodplain meadow sites now. In many cases, this appears to be as a result of the conservation stakeholders' presumption against them. Having said this, the Hayward who oversees the grazing at North Meadow did question whether rolling and harrowing no longer took place because farmers no longer had time for this work whereas, as Rodwell *et al* (2007) note, fewer cattle in the landscape may mean less farmyard manure available locally to the meadows, suggesting that in some cases manuring would no longer be easy to undertake, even if considered desirable.

Farmers were also affected by animal welfare and hygiene legislation in relation to bovine spongiform encephalopathy (BSE), foot-and-mouth disease and bovine tuberculosis (TB), which restrict the movement and mixing of cattle herds, thereby introducing financial and bureaucratic barriers to local cattle farmers' ability and willingness to provide their cattle for meadow grazing, at least in sufficient numbers. For example, at two case-study meadows in 2011, autumn cattle grazing was stopped because the cattle had to be retested for TB, requiring them to be removed from the site. The graziers judged it not worth their while to return them to the meadow afterwards, which would incur additional transport costs. Meanwhile in 2013, the farmer at one of these meadows chose not to exercise his right to graze the site at all (for which he had paid a fee) as he claimed that the cost of TB testing made it financially prohibitive.

Management delivery models and compensation schemes

In terms of the economic relationship between conservation stakeholders, landowners and the managing farmers, four main models were identified:

1. Licensee: the farmer buys from the landowner the right to cut the hay or graze the meadow;
2. Non-economic mutual arrangement: the farmer cuts and retains the hay or grazes the meadow for free as a mutually beneficial arrangement
3. Bought-in contractor service: the farmer is paid as a contractor to cut the hay or graze the meadow
4. Owner: meadow farmed by the landowner

In Model 1 the arrangement is most beneficial for the landowner and the farmer must ensure that he/she can recoup at least the cost of the licence in agricultural goods and benefits. Model 1 was found to be the most common option for meadow management delivery among the case studies. In this case and for Model 2, the agri-environment funding that most landowners receive to support meadow management was not passed on to the farmer. A tendency to move from Model 1 to 2 to 3 was generally noted as landowners and conservation managers experienced difficulty finding farmers to deliver management (Brook Meadow from Model 1 to Model 2, North Meadow grazing moving to Model 3), and the Wildlife Trust staff responsible for Brook Meadow did note that they were considering whether they should share the Trust's agri-environment scheme payments with the farmer, thereby moving to Model 3. Indeed the farmer of another Warwickshire meadow, a small-scale part-time farmer, noted that he did not own most of the land he farmed and that he paid nothing for access to most of it. Furthermore, a number of conservation stakeholders and landowners have taken the initiative of bringing some aspects of meadow and grassland management 'in-house' with their own staff and machinery for hay cutting, or their own herds of cattle for grazing.

Marginal economics and the impact of disputes over meadow value and management

Farmers noted that the economics of meadow management were marginal and the economic situation shifted every year, making management precarious. Farmer's economic motivations for involvement in traditional meadow management were therefore weak and management had to fit in with their other agricultural practices. The owner of one privately-owned meadow:

> Nothing is guaranteed long-term and in that sense it's all quite precarious. The price of hay is quite high now but one year I wasn't sure there was a market for 1300 [small] bales of hay after Foot and Mouth. One year I gave it away to the farmer who cut it. The economics are quite precarious and the situation shifts every year. The most important thing is fostering long-term relationships to take the precariousness out.

This was true particularly for the grazing at this site, where the grazier noted that whilst access to the meadow for grazing was of utility, this utility was clearly judged to be limited and somewhat marginal. Again the owner noted:

> As there are fewer herds and an excess of grazing land, you need to be careful of relationships. If they say it's not worth their while then it's a problem. It's the most stressful

> time of year and you need to remind them to graze the site. The balance is fine. Owners are competing for grazing animals and last year the grazier didn't pay [was not required to pay].

This owner considered the socio-economics of meadow management to be the most significant threat to their future survival. The relationship with the managing farmers was perceived to be very much one of a mutually beneficial non-economic arrangement that was precarious and in which the incentives for the farmers' involvement were weak.

The Natural England agri-environment scheme advisor for this site said that comments were often received from farmers that it was just as well that they received a subsidy to make hay because they were not getting much of a product to sell, again referring to the limited hay quantity and quality. Whether the hay meadows continued to exist in the future would therefore depend on whether the agri-environment schemes continue to exist to maintain the meadows as they are.

Related to the marginal economics of meadow management, a clash of perspectives between farmers and conservation stakeholders was noted to varying degrees over meadow value and management practices. As noted above, at North Meadow, all three hay farmers felt that the hay cut date was too late and were generally critical of restrictions on manuring, rolling and harrowing. This related to the impact of the restrictions on the aspects of meadow value of interest to the farmers including hay yields and hay quality. In the case of hay yields, this aspect of meadow value was specifically discounted as being relevant to meadow conservation in the meadow-management plan (Natural England, 2008):

> Natural England takes the view that floristic diversity is more important than hay yields or profit (Natural England, 2008, p2.2/5).

In the case of North Meadow, this had clearly not yet demotivated the hay farmers sufficiently that they had decided to withdraw their participation, even though they paid a fee each year for the hay crop. This suggests that, whether the agricultural aspects of value were declining or not, sufficient perceived value remained to motivate them to continue their participation. The large size of the resource may mitigate against the lower hay yields, as evidenced by the comments of the farmer of a small Warwickshire meadow, who had noted that the small size of the meadow made managing it inconvenient:

> If it was 8-10 acres [3-4 ha] it would be a lot easier to manage. It's awkward to manage small sites. I would be happy if it was a bit bigger.

This farmer paid for access to the site (hay and grazing) in 2011. Although he thought the sum he paid to be a fair price, he noted that whilst the meadow was useful to him, if an alternative source of grassland became available locally, he would use that instead and he would review his involvement from year to year. In all, his motivation for involvement in the meadow's management appeared to be marginal under the current regime of incentivisation.

It is in the light of such comments no doubt that Warwickshire Wildlife Trust staff commented (above) that they might consider sharing the Trust's agri-environment payments with managing farmers. This interviewee also noted that keeping the farmers on board in the face of economic reality was key, whilst in the case of mixed farmers, the late hay cut clashed with their other work. Ultimately meadow management had to be convenient for the farmer. This also illustrates the

Trust's view that, apart from enforcing the hay-cut start date limit in July, the Trust were otherwise not in a position to dictate the management to the farmer.

At North Meadow the grazier was more positive about the management of the meadow. The grazier, in contrast to the hay farmers (paid under Model 1), is paid as a contractor (Model 3) and so is both incentivised to participate but also enjoys access to the meadow as a grazing resource. He therefore clearly felt that his enjoyment of the grazing resource was not significantly constrained and if so, was in any case adequately incentivised financially, and noted his intention to continue grazing the meadow in the future, suggesting that the cattle grazing at North Meadow is finally secure under this financial arrangement in the current economic climate.

Overall, the low levels of motivation of many participating farmers were again noted by the owner of an Oxfordshire meadow, who underlined the difficulty in maintaining the managing farmers' level of interest to keep involved in managing the meadow:

> It's precarious because farmers can't be bothered with hay anymore. The traditional management has to fit in with people's other agricultural practices.

Discussion

Clearly, farmers' motivations for involvement in the management of HNV grasslands such as floodplain meadows are influenced by a diverse range of positive and negative drivers. Farmers' initial interest and enthusiasm, may encompass a range of factors including aesthetic and affective reasons and interest in cultural landscapes and nature conservation, but ultimately, farmers interest still focuses primarily on economic factors, as found elsewhere (Riley, 2006; Babai and Molnar, 2014; Lieskovsky, 2015). This said, as noted by one farmer in Warwickshire who was happy to manage meadows for whatever objectives others would pay for, farmers can still take a holistic view of meadow value and meadows can provide a range of benefits in keeping with the ecosystem services perspective (UKNEA, 2011). This suggests that, provided the financial incentives are sufficient, some farmers are happy to provide whatever product others are happy to pay for, not only the traditional agricultural products for which they were previously managed (hay and grazing resources) but also biodiversity and cultural (landscape and heritage) goods and services.

However, whilst the existing farmers currently involved in meadow management are motivated to participate, potential candidates in the local landscape to replace them when they retire, or should they drop out of management for other reasons, appear to be limited. Conservation stakeholders at several sites noted the difficulty of recruiting and retaining hay farmers and graziers with reasons cited, as noted elsewhere, including demography and an ageing population (ADAS 1993; Lieskovsky, 2015) as noted by the Warwickshire Wildlife Trust , as well as social and cultural change in rural areas leading to a loss of interest in traditional farming such as hay meadows (Lieskovsky, 2015) as noted in Oxfordshire and for North Meadow, which was not adequately grazed for nearly 10 years. Other structural changes in farming included regional specialisation, which in the UK context is the specialisation of arable in the eastern counties and livestock grazing in the west, as noted by Crofts and Jefferson (1999) and Rodwell et al (2007), such that some landscapes lacked candidate hay farmers whilst others lacked candidate graziers.

The demographics of participating farmers may or may not be a significant issue depending on whether older farmers are more involved in meadow management because this is of greater interest to their generational cohort, or because farmers generally become more interested in such conservation farming as they get older. In the former case, generational turnover will further deplete the pool of motivated candidate farmers, requiring additional incentivisation of younger farmers to participate. Younger farmers may be less interested in the non-economic aspects of meadow value and so their sense of the overall holistic value of meadows will continue to decline if the agricultural aspects of value remain marginal. However, the situation in this regard appears to be similar to that found by ADAS (1993) suggesting that in part at least the latter is true: as farmers age and their perspectives broaden, and if they have diversified incomes, they may become more interested in conservation management. Further research on farmers' motivations to participate in conservation farming and the relationship with farmer age would help address this question.

A further range of disincentives were also noted to depress the enthusiasm of existing hay meadow farmers and graziers, which would also be likely to limit interest among potential candidate farmers in the local landscape in meadow management. As noted above, for upland hay meadows in Northern England, Riley (2006) found that key motivators for hay farmers included hay quality, hay quantity and convenience of management relative to their other work. Therefore any restrictions or barriers that detracted from these motivators would be expected to demotivate meadow farmers. Lieskovsky (2014, 2015) also found for Eastern Europe (Slovakia) that inconvenience of management such as remoteness from settlements, or difficult terrain and soils detracted from a farmer's wish to continue with grassland management, and in turn would impact of economic factors.

Above all though, a major disincentive found across Europe for managing extensive HNV grasslands is the marginal and constantly shifting economics which are easily impacted by a range of factors (Lieskovsky, 2015, Jitea and Arion, 2015). Scotton et al (2014) found that late hay cuts limited hay quality for meadows in the Italian Alps, and as noted for the English meadows in this study, the imposition of a hay-cut limit date by nature conservation stakeholders also limited farmers' views of the value of the hay crop. Similarly, whilst the cessation of fertilisation by manuring appears to have impacted negatively on farmers' impressions of hay yields, and the cessation of what some farmers considered 'traditional' meadow management practices (rolling and harrowing) has also impacted negatively on their view of meadow management. In the case of the English meadows, a further barrier was the legal restrictions on animal movements and cattle-herd mixing (Defra 2013, 2014), which in some cases led graziers to chose not to exercise their right to graze a meadow even though they had paid a fee for the privilege, as cost of transporting animals and paying for bovine TB testing outweighed the benefit derived from the grazing.

Counter-balancing these disincentives, are positive financial incentives such as the agri-environment schemes part-funded by the EU Common Agricultural Policy (European Commission, 2015), intended to compensate farmers and landowners for financial losses resulting from forgoing intensive agricultural management operations deemed damaging to the biodiversity of traditionally managed landscapes. In this research, interviewees noted the key role of agri-environment funding in keeping farmers involved in meadow management and compensating them for low productivity and low hay quality and the resulting marginal economics. Across Europe, a range of researchers note that such financial incentivisation is key to conserving traditional socio-ecological landscapes such as HNV grasslands (Lieskovsky, 2015, Jitea and Arion, 2015; Babai and Molnar, 2014). Indeed agri-

environment funding can also drive extensification (Graf et al, 2014), the reverse of intensification, and in England funding schemes are used to fund restoration schemes (Natural England, 2009). However, the implementation of and eligibility criteria for such schemes vary considerably from country to country (Kleijn & Sutherland, 2003; Dahlstrom et al, 2013). Whereas, for example, schemes to support hay meadow management have been the most widely adopted of all in Switzerland (Knop et al, 2006), in the UK, most of the options relevant to the management of species-rich grasslands are discretionary and targeted, such as the Higher Level Stewardship schemes discussed in this work, and its new replacement Countryside Stewardship.

Nevertheless, the findings of this research indicate that the number of candidate farmers in landscapes local to meadows is limited and may be continuing to decline, whilst farmers were critical of meadow management and the restrictions imposed on management by conservation stakeholders. Their motivation and enthusiasm for involvement in meadow management was clearly limited in many cases. Evidence of the negative impact of this on the future sustainability of meadow management was found in that landowners and conservation stakeholders often experience difficulty recruiting farmers and management operations did not always take place, whilst a trend was noted towards increasing compensation for farmers, suggesting an attempt to counter this difficulty in recruiting and retaining farmers. Model 1 under which farmers saw no benefit from the agri-environment schemes is increasingly proving unattractive with a move towards other models of greater incentivisation. The shift to management models involving increasing levels of financial incentivisation appears to be driven by the need to compensate for a continuing decline in perceived meadow value and a picture of falling farmers' motivations to be involved in meadow management in landscapes where the number of potential candidates is itself declining. Financial support mechanisms therefore clearly influence farmers' motivations for involvement in meadow conservation and are crucial for keeping some involved. Such increase in financial incentivisation of farmers to participate in meadow management is likely to prove to be part of the solution to retaining farmer involvement, and should be a concern for policy-makers responsible for agri-environment schemes. However, whether conservation stakeholders increase financial incentives or conservation organisations bring management 'in-house' using their own staff and equipment to deliver management, this represents an increase in the cost of meadow management.

Contemporary meadow management represents a trade-off between the provision of different kinds of ecosystem services (UKNEA, 2011) and a compromise between the rationale of commercial and conservation management (Crofts and Jefferson, 1999). Clearly farmers' motivations to participate in meadow management are impacted negatively by disputes over the overall value of the meadows, the importance and impact of various management operations they consider to be 'traditional', and the relevance and utility of the restrictions that conservation stakeholders impose on managing farmers and that impact on farmers' perception of meadow value.

The fact that farmers are generally critical of restrictions placed on their agency to manage the meadows as they see fit indicates how they see such restrictions, such as the late hay cut and the perceived presumption against manuring, rolling and harrowing, as depressing further the already limited agricultural value of the meadows. In a possible circular feedback, this sense of the very limited utility of the meadows may discourage the latter three operations even when allowed, in an attempt to spend as little time on management as possible, farmers themselves thereby potentially contributing to the meadows' depressed perceived value.

Such disputes inevitably revolve around a bigger dispute between nature conservationists and farmers about the meaning and value of such meadows, and which aspects of value should take precedence. Comments such as those in the North Meadow management plan that floristic diversity takes precedence over hay yields and economics, and the fact that formal nature conservation documentation focuses on biodiversity interest to the exclusion of other forms of value, demonstrate the clear position of nature conservation stakeholders that botanical and other biodiversity value are preeminent (Ratcliffe, 1977; Nature Conservancy Council, 1989; Robertson and Jefferson, 2000; European Commission, 2007, JNCC, 2007). As conservation stakeholders hold a formal position of authority in conservation of meadows through responsibility for statutory designations and control of agri-environment scheme budgets, they are in a position to impose this view on other stakeholders such as farmers, who are also actors in making meadows.

Whilst meadow management has sometimes been represented as a trade-off between biodiversity and agricultural value, it is not possible to place agricultural value and biodiversity value in opposition (Cronon, 1995; Demeritt, 2001; Proctor, 2001; Castree, 2001, 2005; Adams, 2004; Ginn and Demeritt, 2009). Favouring one form of value over the other therefore represents a compromise between different forms of value. However, it is not possible to make a strict either/or choice between 'natural' value and 'social' value, as both forms are co-produced by the meadow management and cannot be separated, and this therefore represents a false choice.

The difference between farmers' and conservationists' views of meadow value and also the farmers' lack of a sense of control regarding the trade-off that exists between these differing perspectives, appear to lead to farmers' often negative views of meadow management. The above disputes do impact on the aspects of value of interest to farmers, affecting in turn their motivation to be involved in meadow management.

Little evidence was found in this work of a dialogue between the conservation and farming stakeholders regarding these issues, or of attempts to build a consensus across the stakeholder network regarding the meaning of meadow conservation and on the value of traditionally managed floodplain meadows in the contemporary landscape, or to appreciate each others' perspectives on meadow value. The assumption by some conservation stakeholders that the desire to question the restrictions they impose on meadow management is motivated by a wish to intensify management appears to be belied by the generally holistic view of meadow value expressed by most meadow farmers. Such disputes should be resolved and restrictions on management operations may need to be questioned. Greater dialogue between conservationists and farmers regarding meadow value and management, in line with the co-management approach to nature protected area management (Vokou et al, 2014), leading to a greater mutual appreciation of each others' perspectives could play a significant role in securing meadow management into the future.

Conclusions

This work has examined the perspectives and motivations of farmers that deliver management on socio-ecological landscapes based on traditional agricultural landscapes in order to evaluate the risk of abandonment, by means of a case study of floodplain meadows in the UK. Farmers' motivations to participate in conservation management were influenced by their own sense of the value and meaning of traditional grassland management and a balance between positive incentives and negative disincentives. This balance was also found to be influenced by tensions and disputes over HNV grassland value and management that often do not appear to be being resolved to the mutual satisfaction of farmers and other conservation stakeholders. Evidence suggests that such disputes are leading to a negative view of grassland management practices among many farmers, which where inadequately compensated, lead to depression of their sense of the grasslands' value and motivations to be involved in their management. Coupled with demographic changes in the surrounding farming community, the potential pool of candidate farmers to participate in management is often very limited, farmer turnover can be high, and a number of nature conservation organisations are beginning to bring management operations in-house.

A general trend of weakening motivation among farmers managing floodplain meadows is apparent in this study, and it appears that further incentivisation will be required to support farmer retention and mitigate the risk of abandonment. There is therefore a significant potential threat to meadow conservation from the fragility of the managing stakeholder networks and such meadows appear in general to be vulnerable in terms of the socio-economic processes and factors that influence delivery of meadow management and that any accentuation of this situation may lead to neglect or abandonment of some meadow sites.

To maintain existing HNV grassland management networks, more dialogue between conservation and farmer stakeholders is required to form greater understanding and mutual appreciation of each other's views of a site's value, reduce misunderstanding and consolidate relationships to mitigate the risk of farmers losing interest and dropping out of participation in management. Landowners and landowning conservation stakeholders may need to consider carefully the rationale for the restrictions that they put on farmers' agency to determine grassland management and to consider the need to share agri-environmental compensation with the managing farmers in order to incentivise and compensate them for their efforts. Alternatively they may need to plan to manage the sites themselves, for which funding streams may need to be identified. In this study, a trend over time from management by licensees towards contractor-managers was noted, suggesting that in general HNV grassland management is likely to become more costly. In particular, where small lower-profile sites or sites without legal protection are owned by individuals or organisations that lack the funds to undertake management or provide further incentives, management may therefore become increasingly irregular or may cease altogether. Policy-makers responsible for agri-environment schemes will also need to respond to this increase in the cost of management in order to defend such grassland sites from under-management and abandonment.

In countries where agri-environment schemes support traditional extensive HNV grassland management, the inter-relationship between incentives and disincentives on the one hand, and farmers' sense of the value of the socio-ecological landscape are likely to impact on recruitment and retention of farmers, either to assist conservation stakeholders and landowners with system

management, or in the case of landowning farmers, to recruit them into the incentivisation schemes that prevent either system abandonment, or change of land use.

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