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ORIGINAL PAPER

Do conservation and agri-environmental regulations effectively support traditional small-scale farming in East-Central European cultural landscapes?

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Abstract High biocultural diversity is often found in landscapes where farming practices have preserved diverse habitats and many 'traditional' cultural features. We assessed what impacts conservation and agri-environmental regulations had and have on the maintenance of some elements in traditional hay meadow management in two such cultural landscapes (Gyimes—Romania; Őrség—Hungary). Data were gathered by interviews with local farmers and conservation scientists, discussed with farmers. We found that extensive farming was not given adequate weight and explicit function in the regulatory frameworks either in the landscape where traditional farming is still actively practiced, or where it has mostly vanished and/or was transformed. Of the 25 traditional management elements documented in Gyimes, regulations affected seven components directly, and one more indirectly. Four of these impacts were negative and four were positive. Of the 20 traditional management elements in Őrség, 11 elements were regulated, and five more were affected indirectly. Only two elements were affected positively. Our data show that for a more efficient support of traditional farming, more traditional elements must be encouraged, e.g. hayseed scattering, mowing with small machinery, manual cleaning of weeds and shrubs,

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manual hay gathering and extensive manuring. The role of increasing the spatial scale of regulations, considering the whole socio-ecological system and the need for region-specific regulations are discussed. We argue that in those landscapes where traditional small-scale farming is still actively practiced, decision-makers should understand local management practices and concepts first, instead of imposing requirements on farmers that are alien to the local landscape and society.

Keywords Agri-environmental schemes · Biocultural diversity · Hay meadows · EU agricultural policy · Nature conservation · Traditional ecological knowledge

Introduction

Places, where diversity of life in all of its manifestations (biological, cultural and linguistic) is high, are called biocultural diversity hotspots (Maffi 2001; Maffi and Woodley 2010). High cultural diversity in Europe is typical mainly in the so-called cultural landscapes, where local communities have preserved unique cultural identities and a great number of special cultural elements (e.g. dances, social rules) that have co-developed with the local ecosystems and the landscape (Pitte 1994; Frank 2011). Interestingly, high species and in particular habitat diversity is often retained in these cultural landscapes where the lifestyle, culture and the accompanying farming practices have preserved the greatest number of unique, 'traditional' features (Palang et al. 2006; Plieninger et al. 2006; Agnoletti 2007; Paracchini et al. 2008; Babai et al. 2014). Biodiversity is frequently high in these small-scale cultivated agri(cultural) landscapes (Wagner et al. 2000; Tscharntke et al. 2005; Beaufoy et al. 2008; Csergő and Demeter 2012; Babai et al. 2014).

Nowadays these bioculturally diverse agri(cultural) landscapes are mainly populated by socially and economically peripheral communities in Europe (Tryjanowski et al. 2011). There might be a number of reasons for their marginalisation (Danson and de Souza 2012): low productivity of soils (e.g. mountain ranges, rocky land, landscapes dominated by steppes), distance from large cities and industrial centres, migration due to lack of industrial development (depopulation, ageing), as well as the limits to the prosperity of mass tourism (e.g. ski and spa tourism). Conservation and rural development regulations of the Habitats Directive and the Common Agricultural Policy (CAP) have become additional important factors in marginalisation (MacDonald et al. 2000; Mottet et al. 2006; Agnoletti 2007, 2014; Rey-Benayas et al. 2007). In specific cases, political and historical drivers have also played a role (e.g. ethnic islands, and areas along the former Iron Curtain). In marginal landscapes, local culture is often disintegrating at a slower pace and the homogenising impact of global and regional processes has taken longer to infiltrate. Rural populations in these parts still depend directly on the ecosystem services of their respective environments to a significant extent. Intensification of agriculture occurred relatively late or is still incomplete, the traditional low-intensity land-use systems and the traditional—often very complex—landscape structures and local cultural elements are preserved for a long time (Palang et al. 2006; Plieninger et al. 2006; Agnoletti 2007, 2014; Fischer et al. 2012; Babai et al. 2014).

A large number of studies demonstrate that species richness of plants, insects (e.g. Orthoptera, Lepidoptera) or birds is higher in low-input small-scale (agri)cultural landscapes than at intensively used agrarian landscapes (Palang et al. 2006; Schmitt and Rákosy 2007; Paracchini et al. 2008; Kleijn et al. 2009; Báldi et al. 2013). Traditional landscape management played an important role in creating species-rich, high nature-value

grasslands and plays the same role in their maintenance now (WallisDeVries et al. 2002; Schmitt and Rákosy 2007; Middleton 2012; Babai et al. 2014). A positive correlation can be assumed between the high number of preserved cultural traits, the survival of traditional land-use patterns and the high level of biological diversity. In these communities, social institutions (e.g. social norms, cooperation), the relationship to the land (ecological embeddedness), and both tangible and intangible cultural heritage, including traditional ecological knowledge, have been retained up to date (Whiteman and Cooper 2000; Pretty and Smith 2004; Glasenapp and Thornton 2011; Fischer et al. 2012; Babai and Molnár 2013; Babai et al. 2014).

The situation of these peripheral landscapes, however, varies greatly. Conditions for certain East-Central European landscapes have changed substantially in the past few decades. As a consequence of the Socialist-Capitalist transition after 1989, the fall of the Iron curtain, accession to the EU, and the subsequently broadening opportunities of employment in Western European countries, many such regions became less isolated and getting jobs in urban centres is now much easier. Such changes caused a radical transformation in the lifestyle of the local population, including reducing the need for extensive, traditional management methods and land-use patterns, and often leading to the abandonment of farming altogether and the disintegration of the social institutions (Palang et al. 2006; Agnoletti 2014). The changes were accompanied in many cases by the—often delayed—decline of biodiversity (MacDonald et al. 2000; Agnoletti 2007; Schmitt and Rákosy 2007; Hájková et al. 2011; Csergő and Demeter 2012).

Several authors argue that one reason why conservation and agri-environmental regulations cannot accomplish some of their goals is that little attention is paid to traditional, small-scale farming systems, which play an important role in the survival of the cultural and biological diversity (Wrbka et al. 2008; Beaufoy and Marsden 2010; Knowles 2011; Fischer et al. 2012; Báldi et al. 2013; Agnoletti 2014; Pe'er et al. 2014). However, there is a serious lack of research analysing the impact of these regulations and payments on the social structure of local communities, and the elements of traditional small-scale management in the East-Central European countries (Batáry et al. 2015; Sutcliffe et al. 2015).

In the present paper, we studied the impact of conservation and agri-environmental regulations imposed on various elements of traditional hay meadow management in two bioculturally diverse, peripheral East-Central European landscapes (Gyimes region in Romania and Őrség region in Hungary). Past human activities have resulted in a high level of biodiversity of hay meadows. These 'secondary' habitats are more diverse than the local potential forest vegetation (Poschlod and WallisDeVries 2002; Meilleur 2010; Merunková et al. 2012; Wilson et al. 2012; Babai et al. 2014). These meadows are excellent indicators of the social, economic and ecological changes inflicting complex cultural landscapes. Their extent and species richness indicate the various socio-economic trends sensitively, and human management is necessary for their survival (Agnoletti 2007; Hájková et al. 2011; Csergő et al. 2013; Babai and Molnár 2014).

Our first objective was to investigate how conservation and agri-environmental regulations (e.g. national and regional regulations of grassland management, including conservation prescriptions, environment-related regulations, agri-environmental schemes and Natura 2000 measures) have shaped and are still shaping the preservation of certain elements of traditional small-scale grassland management in bioculturally diverse landscapes. Our second objective was to understand whether or not these regulations assist resilient adaptation of extensive grassland management to the changing socio-economic situation.

Table 1 Main features of the two study sites (Gyimes, Romania and Őrség, Hungary)

Features	Gyimes	Őrség
Geographic data		
Location (central coordinates)	N 46.3722°–E 25.5724°	N 46.8800°–E 16.3996°
Settlements	Gyimesközéplok (Hidegségpataka)	44 settlements on 44.000 ha (e.g. Őriszentpéter, Szalafő)
Region	Eastern Carpathians	Alpokalja
Settlement structure	Scattered	Scattered
Elevation above sea level	800–1300 m	200–400 m
Relief	Mountainous	Hilly
Climate	Mountainous-boreal with a Continental influence	Subcontinental-submediterranean with an Atlantic influence
Average yearly temperature	4–6 °C[a]	9.3–9.5 °C[b]
Average yearly precipitation	800–1000 mm[a]	700–850 mm[b]
Proportion of main land-cover types in 1769–1772/1784–1785; 1871–1873/ 1852–1855; 1940/ca. 1960; 2010	Arable: no data (<2)/n.d. (<10)/n.d. (<10)/3 % Grassland: 19[c]/66[c]/60[c]/ 65 %[d] Forest: 77[c]/29[c]/30[c]/26 %[d]	Arable: 51/39/34/15 %[e] Grassland: 10/11/16/4 %[e] Forest: 35[e]/45[e]/43[f]/72 %[f]
Minimum cover of forest in the last 250 years	30 % in 1870[c]	35 % in 1784[e]
Dominant forest tree species	*Picea abies, Fagus sylvatica*	*Pinus sylvestris*, *Quercus* spp., *Carpinus betulus*, *Fagus sylvatica*
Protected areas	Cheile Bicazului Hasmas (Békás-pass—Nagyhagymás) National Park, ROSCI0323 Muntii Ciucului (Csíki havasok) Natura 2000 area	Őrség National Park, Őrség SAC + SPA
Societal data		
Human population in 1860/1961/2010	3600/14,700/14,000[a]	11,000/12,000/8000[g]
Nationalities (2010)	Hungarian (99.8 %), Romanian (0.1 %), Gypsy (0.1 %)	Hungarian (86.3 %), Slovenian (7.7 %), German (2.8 %), Gypsy (1.5 %)[g]
Dominant religion (2010)	Catholic	Catholic
Date of accession to the European Union	2007	2004
Economic data		
Average yearly income/person (2010)	1.610 EUR	5.305 EUR[g]
Population managing meadows in 1960/2010	ca. 98/ca. 90 %	ca. 80/ca. 10 %
Main area of meadows per family in 1960/2010	2.6/2.4 ha	ca. 4.2/ca. 10 ha grasslands
Population working in animal husbandry in 1960/2010	ca. 98/ca. 90 %	80/5 %

Table 1 continued

Features	Gyimes	Őrség
Livestock unit per family in 1960/2010	ca. 5/ca. 3	ca. 7/ca. 0.6

[a] Ilyés (2007)

[b] Dövényi (2010)

[c] Babai (2014)

[d] Sólyom et al. (2011)

[e] Balázs et al. (2012)

[f] Hahn et al. (2012)

[g] www.ksh.hu

Materials and methods

Study area

Two landscapes were studied and compared (Table 1; Figs. 1, 2): Gyimes (Romania) is a young (approximately 250 years old) cultural landscape, situated in the Eastern-Carpathians (Hofer 2009). Őrség (Hungary) is a hilly area inhabited since the Neolithic in the western rim of the Carpathian-basin (Bánffy 2004). An important aspect in selecting the two study sites was their specific, rich, archaic vernacular culture (Gyimes: Tánczos 1994; Magyar 2003; Őrség: Kardos 1943; Dömötör 1960) and their species-rich hay meadows (Gyimes: Csergő and Demeter 2012; Őrség: Pócs et al. 1958).

In Gyimes, the main source of most people's livelihoods is traditional extensive farming. Grasslands dominate the landscape (Sólyom et al. 2011), and the majority of the traditional grassland management elements are still carried out (Babai and Molnár 2014; Babai et al. 2014). Key livestock include cattle, followed by horses and sheep (Sólyom et al. 2011). The Ceausescu era (1967–1989), characterised by severe economic hardships sustained traditional grassland management in Gyimes, which was however shaken later on by the socio-economic changes in the years following the political transition (1989) and then the accession of Romania to the European Union (2007) (Knowles 2011; Babai et al. 2014).

Fig. 1 A typical cultural landscape in Gyimes (Transylvania, Romania)

Fig. 2 A typical cultural landscape in Őrség (West-Hungary)

In Őrség, traditional farming survived in the course of the Socialist agricultural reform (after 1950) in part time household farming using small areas, and following 1989—to a lesser and lesser extent—in the re-organised family-owned small holdings (Kovács-Mesterházy pers. comm.; Gyöngyössy 2008). As a result of the diminishing grassland management, forests encroached on a substantial part of the hay meadows (Balázs et al. 2012; Hahn et al. 2012). By the beginning of the 2000s, the number of cattle stock was reduced everywhere in the region and disappeared in many villages altogether. Most of the hay yield is used for winter fodder to the livestock of the national park or the few animals left over in the village communities, some is sold (as hay and—to a lesser extent—as biofuel transported to Austria).

Mountain grassland communities like the *Arrhenatheretum elatioris*, *Festuco rubrae-Agrostetum capillaris*, *Anthoxantho-Agrostietum capillaris*, *Violo declinatae—Nardetum* are common in Gyimes (Babai 2014). In Őrség there is a large proportion of wet meadows in addition to the dry and mesophilous grasslands, including the *Junco-Molinietum*, *Succiso inflexae-Deschampsietum caespitosae*, *Carici vulpinae-Alopecuretum pratensis*, *Pastinaco-Arrhenatheretum*, *Alopecuro-Arrhenatheretum*, *Anthyllido-Festucetum rubrae* (Király et al. 2011). Traditionally there are/were more 'intensively' managed grasslands in both landscapes in between the houses and at the outskirts of the settlements (called *inner hay meadow* in Gyimes and *düllő* in Őrség), and meadows used more extensively in the more distant hillsides or in the mountains, in the woods (*outer hay meadows* and *field meadows*, respectively). The extent of species-rich meadows is significant in both cases up to date. The average alpha-diversity of the meadows in Gyimes and Őrség is 35–43 species/16 m^2 and 24–36 species/4 m^2, respectively. The average beta-diversity of the meadows (Shannon diversity index) in Gyimes (scale 16 m^2) and in Őrség (scale 4 m^2) is 2.45–2.62 and 1.60–2.27, respectively (Babai et al. unpublished). Protected and/or endangered species of hay meadows to be noted include *Crex crex*, Carpathian endemic species, like *Phyteuma tetramerum*, *Scabiosa lucida* subsp. *barbata*, *Viola declinata*, furthermore *Trollius europaeus*, *Pulsatilla patens*, *Dianthus compactus*, *Centaurea kotschyana*, *Gladiolus imbricatus*, *Nigritella rubra* in Gyimes and *Maculinea teleius*, *M. nausithous*, *M. alcon*, *Euphydryas aurinia*, *Crex crex*, *Hemerocallis lilio-asphodelus*, *Gentiana pneumonanthe*, *Trollius europaeus*, *Spiranthes spiralis* in Őrség.

Unlike in many other mountain regions in Europe, abandonment of meadow management started in Gyimes only in the past few years and affects <5 % of all meadows, while

in the neighbouring landscape, Csíki-havasok the rate of abandonment of mountain hay meadows ranged up to 80 % (Demeter and Kelemen 2012). Compared to the 1950s, only 60 % of the grasslands is used in Őrség today. Much of the abandoned meadows were colonised by forest and shrub vegetation in recent decades (Király et al. 2011).

Nature conservation in Gyimes began first in 2007 as a regulatory framework accompanying the agricultural subsidy systems of the European Union. Even though Gyimes has been a Natura 2000 area since 2011 (Law 49/2011; see Table 1), no payments are yet in place for land managers in Natura 2000 areas in Romania. The development of Natura 2000 management plans is currently in progress, they are expected to take effect in a 2 years time. The Landscape Protection Area in Őrség was established back in 1978. Act No 4. of 1982 with the force of law on the protection of nature was promulgated in the year of 1982, repealed later on by the Nature Conservation Act (Act No 53. of 1996). Őrség National Park was founded in 2002 and Nature 2000 regulations entered into force following the access of Hungary to the European Union in 2004 (Government Decree No 275./2004; Government Decree No 269./2007 laying down the rules of land use for the maintenance of Natura 2000 grassland areas; and Decree No 128./2007 of the Minister of Agriculture, laying down the detailed rules of the compensation funding to be provided for management of Natura 2000 grassland areas).

Data collection and analysis

Two types of data sets were collected for the analysis: (1) detailed documentation of all the elements of traditional small-scale grassland management and (2) conservation and agri-environmental regulations affecting traditional grassland management. Traditional use was considered as the management methods applied before the mechanisation and the extensive use of chemicals, with the main features including manual hay mowing, manual hay gathering and extensive low-intensity organic manuring.

Traditional grassland management was documented with the help of semi-structured and structured interviews and by free listing (for the question "What improves a hayfield?"). The respondents were local farmers. Key topics included the following: date and time as well as the number of cuts per year, implements used, methods of hay gathering, manuring, cleaning of meadows, grazing of aftermath, oversowing, burning, drainage etc. Interviews were carried out in 2011 and 2012–2013 in Gyimes and Őrség, respectively. 20 men and 11 women (average age 66 years) and 18 men and 16 women (average age 78 years) were asked in Gyimes and in Őrség, respectively. The age of respondents was lower in Gyimes because in this region younger farmers still use traditional methods. In Őrség, only the generation born in the period from the 1920s to the 1950s remember the traditional grassland management methods well. Interviews were all recorded and transcribed. The percentage of farmers using a particular element of traditional management was estimated for both landscapes (5: 81–100 % of all farmers actively used the method in question; 4: 61–80 %; 3: 41–60 %; 2: 21–40 %; 1: 1–20 %; 0: 0 %).

All conservation and agri-environmental regulations were recorded for both landscapes. In Őrség, some farmers were aware of nature conservation operations since 1978, when the Landscape Protection Area was established. In 2002 the National Park was formed, which did not represent any change in nature conservation rules, but the presence of officials and the attention paid to grasslands became more intensive in the region. The agri-environmental payments became available with the accession of Hungary to the European Union

in 2004, and the land-use regulations determining the management of Natura 2000 grasslands entered into force in 2007. Since regulations changed substantially over the past 35 years, the studied period was split into two stages: (1) before the accession to the EU (2004), when the regulations of the Nature Conservation Act were in place; and (2) after 2004, when regulations of the Natura 2000 areas and the agri-environmental schemes took effect. In Gyimes, agri-environmental regulations emerged only after 2007. Gyimes was classified as a high nature-value grassland area, therefore this type of agri-environment scheme was applied (Programul National de Dezvoltare Rurala 2007–2013).

We evaluated the impact of regulations on each element of traditional grassland management. Which traditional practices are explicitly supported, which are tolerated and which are prohibited by the mandatory and voluntary (agri-environmental schemes) rules of regulations. Attempts were made to reveal indirect influences as well as direct impacts. These points were consulted with the local farmers as well. Focus group discussions were organised in 2013 and in 2014 in Gyimes and Őrség, respectively, where farmers, conservationists and scientists discussed the interactions of traditional small-scale grassland management and conservation and agri-environmental regulations.

We did not investigate the impacts of each traditional management elements on biodiversity separately. Experiences gained in Gyimes (Babai and Molnár 2014; Babai et al. 2014) suggest that traditional grassland management as a whole supported and maintained highly species-rich meadows, outstanding at the European scale as well (Csergő et al. 2013).

Results

A number of similarities were observed in the individual elements of traditional meadow management in the two studied landscapes (Tables 2, 3). Spring cleaning of hay meadows, grazing aftermath, scattering hayseed, management of moss dominated spots, manuring of inner meadows, aftermath mowing, etc. were or are still important parts of the small-scale grassland management in both landscapes. At the time of the study, no data were available from Őrség on the repression of toxic herbaceous species, a current spring activity in Gyimes. Wet grassland types dominated by tall *Carex* species are a problem mainly in Őrség, where locals controlled them by burning, more intensive mowing and drainage in the past.

25 traditional management elements were identified in Gyimes. 24 of them are still regular components of grassland management (Table 2). Regulations affected seven components directly, and had an indirect impact on one more. Four of these impacts were negative and four were positive.

Of the 20 identified traditional management elements in Őrség, 11 elements were explicitly regulated (Table 3), and five additional components were affected indirectly by the regulations. Regulations have covered more and more elements over the past 35 years, while only seven components of the traditional management methods remained more frequently in use. Only two of the traditional management elements were affected positively by the regulations, the rest (five) was affected negatively.

Table 2 Elements of traditional small-scale grassland management in Gyimes, their frequency in the 1980s and now (5: 81–100 % of all farmers actively use(d) the method in question; 4: 61–80 %; 3: 41–60 %; 2: 21–40 %; 1: 1–20 %; 0: 0 %) and the relevant applicable regulations since 2007, with their direct or indirect impact on the elements of traditional meadow management

Components of traditional grassland management	Frequency	Regulations	Effect	Impacts
Spring cleaning of hay meadows (collecting twigs, litter—raking)	5/5	Not regulated	0	The regulations have no direct or indirect impact
Levelling ant hills	5/5	Not regulated	0	The regulations have no direct or indirect impact
Levelling mole hills	5/5	Not regulated	0	The regulations have no direct or indirect impact
Burning of collected twigs, leaves etc.	5/5	Not regulated	0	The regulations have no direct or indirect impact
Control of native meadow weeds (*Veratrum album, Colchicum autumnale, Helleborus purpurascens, Pteridium aquilinum*)	4/4	Not regulated	0	Several species on the list are protected in Hungary, *Colchicum* in Austria is not allowed to be eradicated in non subsidised areas, either (Winter et al. 2011)
Pushing back the forest edge (cutting trees, bushes, tall-herb species in edges)	5/4	Regulations require maintenance of parcel boundaries but pushing back of the edges is not explicitly subsidised	+	Indirect impact can be assumed. Excessive clearing may decrease mosaicity and habitat diversity
Hay-making	5/5	Parcels must be cut annually	+	Regulations reduce the probability of abandonment
Starting date of the first mowing: second half of June (traditionally: 24 June)	3/5	Mowing may be started after 1 July	–	The regulation has a delaying effect on the inner hay meadows, but has no impact on the outer meadows
Starting date of the second mowing (traditionally: the beginning of August)	3/5	Not regulated, but it is influenced by the date of the first mowing	0	Allows a starting date of second mowing optimised to locals. Indirect impact: the amount of aftermath is less in the inner meadows due to the delayed date of the first mowing
Manual hay mowing	5/3–4	Manual mowing is subsidised but is not mandatory	+	Hand cut grass results in larger quantities of hay and the hay is less dusty
Manual hay gathering	5/5	Not regulated	0	–
Parcel rotation (mowing order changed annually)	3/3	Not regulated	(–)	Delaying of the first mowing reduces the potential for rotation indirectly
Aftermath grazing	5/5	Not regulated directly	0	Regulations by delaying of the first mowing may have an indirect impact on this

Table 2 continued

Components of traditional grassland management	Frequency	Regulations	Effect	Impacts
Second aftermath grazing	5/5	Not regulated directly	0	–
Manuring (on inner meadows that were once arable fields)	5/5	Not regulated directly, permitted	0	Regulation is imminent, which would result in serious setbacks to traditional grassland farming
Levelling of manure (raking)	5/5	Not regulated	0	–
Oversowing with hayseed	5/4–5	Not regulated	0	An indirect impact may be possible, when the number of seeds is reduced in the hay due to the delayed first mowing
Oversowing with *Onobrychis viciifolia*	5/5	Not regulated	0	Restrictions are expected as it is not a native species. Such a regulation would have a harmful impact on traditional grassland farming through impaired hay quality
Elimination of moss-dominated patches (burning, tearing up with pitch-fork, manuring)	2/1–2	Not regulated	0	Should it be regulated, it was negative to traditional management, but has no real significance, since only a few people perform it
Drainage of spring fens	2/1	Not regulated	0	Imminent regulation. This would be negative to traditional management, but has no real economic significance (such places are rare, drainage is infrequently done)
Fence maintenance	5/5	Not regulated	0	–
Solitary trees left on meadows	3/3–4	Maximum number of woody specimens in a unit area is regulated	(+)	The requirement does not substantially differ from traditional practices
Traditional summer huts and hay hacks	4/5	Not regulated	0	–
Stubble height	n.r.	Not regulated	0	The requirement to leave a stubble field higher than 2–3 cm would make manual mowing impossible
Burning (*Spiraea chamaedryfolia*, *Nardus stricta* and mossy patches)	3/3	Burning is prohibited, but by other types of regulations	–	This prohibition has an impact on the traditional suppression of *Nardus*

Table 2 continued

Components of traditional grassland management	Frequency	Regulations	Effect	Impacts
Parcel size	n.r.	Only parcels larger than 0.3 hectare are subsidised	–	Has a harmful impact on farmers, and does not prevent the growing scale of farming and hence, the process of homogenisation of land use

Nr not relevant

Discussion

The analysed regulations had a wide range of impacts on individual elements of traditional small-scale grassland management of Gyimes and Őrség. Both cultural landscapes were exposed to both positive and negative impacts as a result of the regulations, which affected them either directly or indirectly. In many cases however, the regulatory requirements did not influence individual elements of traditional management.

The regulations in Gyimes encourage manual hay mowing, thus providing an effective incentive for the survival of this element. Based on our data, a number of other opportunities are given for supporting traditional management elements (see Table 4 for an overview). For instance, it would be worth subsidising manual cleaning of the hay meadows and manual hay gathering, scattering of hayseed, manuring of the inner meadows in every 2 to 4 years, parcel rotation, grazing of aftermath, preservation of the small parcel size and traditional fence maintenance. Although manuring of inner meadows could reduce biological diversity locally, the hay and aftermath produced here is economically important for the small-holdings. Payments for manuring with livestock manure can therefore indirectly serve the interest of nature conservation. Restrictions imposed on manuring would accelerate the abandonment of the species-rich outer hay meadows because the farms would be unable to produce sufficient amount of fodder for winter, and hence, the number of livestock would decrease, many of the high nature value farmland areas would be abandoned. Payments for the scattering of hayseed is suggested to be a high priority, since hayseed is mostly applied on manured inner meadows, clearly reducing the negative impact of extensive manuring on biodiversity (hay seed has a high number of viable seeds, Török and Babai unpublished).

In Őrség, conservation measures became more frequent after the area was designated a Natura 2000 area and agri-environmental subsidies became available. The only positive effect of the conservation requirements is associated with the rules encouraging the maintenance of grasslands: mandatory hay mowing or grazing and prevention of scrub encroachment. Conservation and agri-environmental regulations could be used to incentivise hayseed scattering, hay mowing with small-scale machinery, parcel rotation, extensive hay meadow cleaning, aftermath grazing and preservation of the small parcel size (Table 4).

Prescriptions irrelevant from a nature conservation perspective but with an adverse impact on traditional grassland management were found in both landscapes. There were instances when the problems caused by such regulations were bigger than their positive influence on the maintenance of management through payments. According to our data,

Table 3 Elements of traditional small-scale grassland management in Őrség, the frequency in three periods of time (1960s/1978–2003/2004–2014), the relevant applicable regulations, their effects and the direct and indirect impacts of regulations on traditional elements in the two latter periods

Components of traditional grassland management	Frequency	Regulations	Effect	Impacts
Spring cleaning of hay meadows (raking, harrowing)	5/1/0	Not regulated/harrowing is prohibited.	0/–	Lack of it makes mowing more difficult
Collecting twigs and litter using a rake	5/3/2	Not regulated/not regulated	0/0	–
Raking, levelling of ant hills, mole and vole hills	5/1/1	Not regulated/not regulated	0/0	–
Hay mowing	5/3/4	Parcels must be mown or grazed each year/mandatory mowing or grazing	+/+	Reduces abandonment of meadows
Starting date of the first mowing: first half of June	5/3/3	Not regulated/according to certain regional schemes: before 1 June or after 15 July	0/0/–	Some regulations permit the traditional date, but others permit only earlier (!) and later mowing. Late mowing often results in poor hay quality
Manual hay mowing	4/1/1	Not regulated/not regulated	0/0	Hay mowing by hand is not relevant any more. Mowing by small machinery is not given a higher subsidy rate either
Manual hay gathering	5/3/1	Not regulated/not regulated	0/0	–
Aftermath mowing	5/2/1	Not regulated/ mandatory in certain schemes, and forbidden by the national park in certain places	0/–	This traditional practice is frequently prohibited
Second aftermath mowing	4/1/0	Not regulated/not regulated, but the national park does not endorse it	0/–	It happens only at small scales, nature conservation does not have a significant impact on mowing
Parcel rotation	1/1/0	Not regulated/not regulated	0/0	Missing rotation causes homogenisation in major holdings
Aftermath grazing (after first mowing)	1/1/1	Not regulated/not regulated (forbidden in some schemes)	0/0(–)	–
Second aftermath grazing (after second mowing)	4/2/1	Not regulated/not regulated (forbidden in some schemes)	0/0(–)	–
Scattering of ashes	3/1/1	Not regulated/not regulated	0/0	It would not be relevant any more
Scattering of hayseed	5/2/0	Not regulated/not regulated	0/0	Not practiced any more

Table 3 continued

Components of traditional grassland management	Frequency	Regulations	Effect	Impacts
Burning of moss and litter covered patches	1/2/1	Subject to a permit/subject to a permit	(–)/(–)	Public awareness holds that it was prohibited, therefore this practice is vanishing
Manuring	5/3/0	Manuring is not regulated, use of synthetic fertilisers is subject to permit (which means de facto that it is prohibited)/both manuring and fertilisation are forbidden	–/–	The prohibition of organic manuring has a negative impact on the yields of traditionally managed hay meadows
Deliberate suppression of species (e.g. cutting of bushes)	5/2/3	Mandatory/mandatory	+/+	Maintenance of the grassland is mandatory. Any payment is eligible for parts which are not shrubby. Has an indirect impact on grassland maintenance
Restoration of *Carex*-dominated patches into meadows by grazing, burning and drainage	2/1/1	Burning is subject to permit, drainage is prohibited/ burning is subject to permit, drainage is prohibited	–/–	None (due to low economic significance of this practice now)
Drainage of meadows along streams	1/0/0	Forbidden/forbidden	–/–	None (due to low economic significance of this practice now)
Irrigation by channelling stream water onto meadows	1/0/0	Forbidden/forbidden	–/–	None (due to wet climate)

regulations in Gyimes had a negative impact on the date of the first mowing and payments did not support the management of parcels smaller than 0.3 ha. From the nature conservation point of view, none of these restrictions are justified. Ca. 40 % of the meadow parcels in Gyimes is smaller than 0.3 ha (authors' estimates). When farmers are not eligible for payments for these parcels, it acts as an incentive to consolidate land into larger parcels, reducing the land-use diversity and hence nature value. The regulation of the date of first mowing intends to solve a practically non-existing issue. No Gyimes farmer would ever cut hay too early, for they recognise their economic interest in securing high yields and high quality on the long run (see Babai and Molnár 2014; Babai et al. 2014). This rule is designed for intensive lowland grasslands. It makes no sense to counter the long standing traditions in Gyimes, the regulation does not have any positive impact from either ecological, or the nature conservation perspective.

In Gyimes, individual elements of traditional grassland management were hardly affected directly by the regulations (except manual hay mowing and the date of first mowing). However, payments had an offsetting effect. Farmers in Gyimes receive extra cash for hay mowing, which they do anyway. Such an incentive had a substantial

Table 4 Suggestions for conservation and agri-environmental regulations to support traditional management of meadows in two East-Central European landscapes

	Gyimes	Őrség
Regulation specific to the type of grassland	Requirements specific for grassland types would be necessary (there are valuable and less valuable types of grasslands)	Requirements specific for grassland types would be necessary (there are valuable and less valuable types of grasslands)
Cleaning of the hayfield in the springtime (e.g. gathering the litter)	Not to be regulated, it is a natural economic interest of the farmers, and the method they use can be accepted from the nature conservation perspective	It should be supported in order to prevent enrichment of nutrients on species-rich meadows (to protect specialist species preferring poor acidic soils)
Selective, mechanical removal of certain native hayfield weeds	This ought not to be regulated or prohibited, because the traditional and current practice is not harmful from the nature conservation perspective, and is very useful from the economic perspective. The value of the hay would be reduced if selective weeding was not possible	Not relevant since no current practices exist
Number of cuts per year	No need for regulation, the method used by local farmers can be accepted from the nature conservation perspective	Such a regulation impedes farming. Where intensively protected species (e.g. *Maculinea alcon*, *Crex crex*) do not require so, traditionally proven mowing twice should be encouraged
Dates of hay mowings	It would be worth to trust the farmers in deciding the dates of mowing the inner meadows because this would assist the survival and adaptation of the landscape scale traditional grassland management	The highest level of versatility within the traditional time horizon should be supported
Mowing of hay by hand	We suggest a higher level of financial support than at present	Support is not relevant any more
Mowing of hay by small machinery	This is not part of the traditional usage, yet it contributes to the utilisation of the grasslands, because it saves labour. No harmful effect to biodiversity is known, and a beneficial impact may be that it increases stubble height. We suggest higher financial support	It would be advantageous to encourage it in the case of more sensitive grasslands. Indirectly it could promote the survival of small holdings
Stubble height	You cannot leave high stubbles by manual mowing, therefore as long as this method is used in the landscape, the height of the stubble must not be regulated	High (8–10 cm) stubbles are beneficial for the arthropods, but may cause loss in hay yields in the short run. On the long run this effect is negligible because the grassland regenerates more intensively from a higher stubble
Parcel rotation	It could be made a general practice again by financial incentives, which would enhance land-use diversity in the landscape	It can be encouraged indirectly, through the support of variable timing

Table 4 continued

	Gyimes	Őrség
Aftermath grazing	Grazing of large stocks of sheep on aftermath was not a traditional method, spreading of this practice needs to be limited	Grazing of aftermath was not part of the tradition (only grazing of second aftermath), yet it can be endorsed in certain parts which are permitted to be cut only once
Burning	It is a rare but important element of the traditions. It might be important under certain circumstances (against mossy vegetation and *Spiraea*). No need for regulation	It was not an important part of the tradition. It should only be used as a second-best solution
Organic manuring	It is permitted on the inner meadows, approval is a condition precedent for the survival of this kind of farming. A prohibition could entail serious consequences (diminishing quality and quantity of aftermath, problems with manure disposal)	Limited use of organic manure must be considered—subject to permission—because it has a substantial positive impact on the livestock husbandry of the region. However, excessive manuring need to be avoided
Oversowing with legumes	Not to be regulated. It is a natural economic interest of the farmers. Oversowing with non-commercial (locally collected) *Onobrychis* does not cause any substantial loss of biodiversity	Partial oversowing with native legumes (e.g. *Anthyllis vulneraria, Lotus corniculatus*) ought to be permitted in a limited manner on the secondary grasslands developed from abandoned arable fields
Local hayseed scattering	Promotion and encouragement are found to be important because scattering may substantially increase species diversity in grasslands	Promotion and encouragement of scattering of hayseed free of seeds of tall wetland sedges and invasive species are found to be important because scattering may substantially increase species diversity
Suppression of sedges	Not to be promoted in this landscape, but not necessary to prohibit	Suppression of sedges in place of former hay meadows by grazing should be supported
Fence maintenance	Fences made of traditional materials (as opposed to barbed wire) is worth supporting, in particular when shrubs and tall-herbs can manage to grow beside them (and thus provide microhabitats)	It has never been a part of traditional management
Subsidised parcel size	It is indispensable for the survival of the high level of land-use diversity that parcels smaller than 0.3 ha also be entitled to subsidies, and the maximum parcel size should not exceed 5 ha	It is indispensable for the survival of the land-use diversity that parcels smaller than 0.3 ha also be entitled to subsidies, and the maximum parcel size should not exceed 5 ha

supportive impact on the survival of traditional grassland management and decreased the speed of abandonment effectively.

Regulations in Őrség prohibiting elements of grassland management include the rules on manuring, oversowing and drainage. In certain cases the regulations forbid or do not

endorse hay mowing in the first half of June and the mowing of the aftermath. Lack of subsidies for the economically not profitable farming practices (scattering of hayseeds, hay mowing by hand or small machinery) also had an indirect adverse effect on small-scale farming in Őrség. Certain elements of these restrictions may be justified from the conservationist perspective (e.g. prohibition of aftermath mowing in order to protect the butterfly species *Euphydryas aurinia* and *Maculinea*-ssp, cf. Kőrösi et al. 2014). However, no experimental conservation biological research is yet available to demonstrate the effect of others. Low nature-value grasslands developed on the old-fields account for ca. 60 % of all the grasslands and are important components of livestock husbandry in the region. In low nature-value areas with low regeneration perspectives (isolated from species-rich meadows) more intensive management (together with practices promoting regeneration) could be allowed in order to develop a more profitable and sustainable farming structure at the landscape scale. Special regulations would be needed for these areas, which in turn could contribute to the survival of the species-rich grasslands indirectly.

Our findings suggest that regulations were not sufficient enough to ensure the survival of traditional grassland farming in Őrség. However, traditional grassland management was already declining at the time nature conservation regulations were imposed on this landscape. In order to understand the situation one should take into account that the possibilities and attitudes of farmers changed in a great extent over the last 50 years. The growing farm and parcel sizes and the increasing mechanisation resulted in the homogenisation of the mosaic-like cultural landscape in a large extent, synchronised management activities and, as a result, decreased land-use diversity. This entailed the reduction of the richness in the cultural components associated with the management practices, too. Today's (non-traditional) practices would not ensure the landscape level buffering effect (i.e. the permanent availability of suitable habitat patches), which was provided by the former traditional practices (cf. Benton et al. 2003).

In summary our results show that small-scale extensive farming practices were and are not given adequate weight and explicit function in the regulatory frameworks. This is the case both in a landscape where traditional farming is still actively practiced (Gyimes), as well as where it has mostly vanished and/or was transformed but is still present to a small extent (Őrség). None of these regulations were designed with the systems in Gyimes or Őrség in mind, so it is not surprising that they do not support them well (a system appropriate for Gyimes and Őrség would probably not be appropriate for an intensive lowland grassland).

Suggestions for the regulation of grassland management in East-Central Europe to better support traditional management

Many authors argue that the agricultural policy of the European Union does not effectively support biodiversity-friendly small-scale grassland management (see e.g. Wrbka et al. 2008; Beaufoy and Marsden 2010; Fischer et al. 2012; Peeters and Warda 2012; Pe'er et al. 2014). Our analysis showed that only a few elements of traditional small-scale grassland management were explicitly included in the regulatory frameworks. It can be concluded that nature conservation prohibited only a few of the elements of traditional grassland management, but it did not encourage or support them positively, either. Also, regulations did not communicate effectively the significance of traditional management elements. Nature conservation regulations were typically characterised by non-restriction and

prohibition. Our analysis showed that there are still a number of elements which could be encouraged and subsidised, therefore there is still an amount of unused capacity in the system. Our study may provide multiple experiences and recommendations to the more efficient preservation measures of biocultural diversity in Europe.

We argue that the spatial scale of regulations in cultural landscapes should be increased to the landscape level (cf. Tscharntke et al. 2005; Kleijn et al. 2009; Liu et al. 2014) and should not remain at the level of individual parcels or farms. On the low nature-value grasslands, for instance, more flexibility should be given to the economic management considerations (e.g. on the inner meadows in Gyimes and on the old-fields with low regeneration potential in Őrség). This would enhance the financial viability of the small-holdings and thus the need for the hay from high nature-value species-rich grasslands would also be retained.

The wider context of conservation and agri-environmental regulations is also important in landscapes with high biocultural diversity: the entire socio-ecological system need to be considered as a whole (Davidson-Hunt and Berkes 2008). We agree with the suggestions by Fischer et al. (2012), who recommend the development of new strategies in the socio-ecological systems and the building up of closer and new type of links between nature and people.

We argue that one reason why the consideration of the wider context may be important is to diversify the set of objectives in nature conservation. Nature conservation and agri-environmental regulations must recognise the essential economic, social, cultural and natural factors that generate and maintain the local system (see 'diversity of motivation' in Gugič 2009). Traditional small-scale farming contributed to the development of highly complex socio-ecological systems, including high diversity grasslands (WallisDeVries et al. 2002; Agnoletti 2014; Babai et al. 2014) and social institutions (see e.g. the well developed networks of cooperations in Szabó 2009). Unfortunately, nature conservation administration sometime does not think at the scale of the socio-ecological system, but sets the protection of one species or another as the single most important goal. If focusing on the target species is overexaggerated, such an approach may endanger the survival of the extensive farming system, the cultural heritage and biological diversity as well, thus the socio-ecological system as a whole. Focusing on target species may result in a regulatory framework disadvantageous for a number of economic reasons and frequently incomprehensible for farmers. They may cause economic, social and environmental damages alike (the carrying capacity of the landscape decreases, conflict situations emerge). Sometimes they even make traditional farming businesses no longer viable. The farming itself, the environmentally friendly versions of which would be the condition precedent for the conservation of the target species.

An additional key issue is the planning of the future of farming in cultural landscapes. The promotion of low-input environmentally-friendly land-use systems need to be developed or re-engineered so that they can attract and provide competitive revenues for the young generations (cf. Pe'er et al. 2014). This is necessary because members of the younger generations in the peripheral regions are less and less inclined to carry on the cultural patterns if they are not sufficiently profitable in business terms.

The survival of local traditional management practices could be assisted greatly by participatory mechanisms, a set of approaches used for a long time in other places of the world (see e.g. Luz 2000; Lynam et al. 2007; Winter et al. 2011), which is a not yet widely accepted way of community involvement, awareness raising and motivation of the stakeholders in East-Central Europe (but see e.g. Gugič 2009; Hanspach et al. 2014). Using

participatory methods, the affectionate—and often very strong—ties of people with the landscape can be reinforced which may provide the motivation to more conscious value conservation approaches. As a result, more effective preservation of biocultural diversity may occur. Participatory planning may help to avoid the adoption of ecologically unnecessary regulations causing economic harm and unjustified stress to farmers. These, in fact, particularly threaten economically shaky traditional low-input farming systems and contribute to the rejection of nature conservation as whole in a substantial extent. In many landscapes farmers, do not hold nature conservation management as a helpful and positive institutional approach, but a forbidding factor which limits their human well-being. As a consequence, conservation initiatives are felt by farmers mostly as a negative experience, even if their actual impact on the farming practices is neutral or positive.

The enlargement of the European Union to the east generated a predominantly unidirectional flow of experiences and regulations from the West to the East. In many East-Central European countries a set of regulations is in place, which had been conceived and developed in and for old Member States and were only poorly adapted to the new Member States concerned (Knowles 2011; Tryjanowski et al. 2011; Dahlström et al. 2013; Sutcliffe et al. 2015). Experiences gained in the past few years suggest that many western practices, even the 'best practices' cannot be transferred without alterations, because both the landscape and the society function differently in East-Central Europe, and different socio-cultural processes dominated the past decades (cf. Palang et al. 2006; Gugič 2009; Elbakidze et al. 2013). We are convinced that the development of region specific regulations could increase their efficiency (Wrbka et al. 2008; Knowles 2011; Báldi et al. 2013; Babai et al. 2014). In the landscapes where traditional grassland management is still operational, regulators should learn local management practices first and ensure that if functional practices survived, they are adapted, instead of forcefully imposing requirements on farmers which are alien to the local landscape and society (cf. Vandeveer and Carmin 2004; Knowles 2011; Babai et al. 2014).

We argue that in the East-Central European landscapes where traditional grassland management is still a living practice (such as many high nature-value farmlands in the mountain ranges of the Carpathians and the Balkan peninsula, cf. Beaufoy et al. 2008), the main task and function of any regulatory framework should be to ensure the survival and resilient adaptation of the current management practices, and the extension of financial subsidies to traditional management elements beneficial from the nature conservation perspective. In the remaining living cultural landscapes, the main purpose of the direct financial support should not be the promotion of mechanisation and the modernisation of agricultural production, but nursing of the currently practiced elements of traditional management sustaining both biodiversity and cultural traditions which are adequate in the twenty first century. Indirectly, however, other European and national regulations may also assist the survival of traditional farming practices (cf. Peeters and Warda 2012), such as supporting small-scale milk production and organic and grass-fed veal, and partly the development of eco-tourism and gathering of organic medicinal herbs. They could help in maintaining the economic profitability of traditional farming, reducing dependence on external subsidies. It will be easier and cheaper to support traditional management then substitute it later on (see e.g. Gugič 2009; Knowles 2011; Báldi et al. 2013; Babai et al. 2014). Additionally, nature conservation management is simply not designed for full scale substitution of the complex traditional farming systems (see e.g. the lower diversity of seed dispersal mechanisms in non-traditional landscapes, Poschlod et al. 1998), and hence, preservation and long-term maintenance of biodiversity.

In those East-Central-European landscapes, where traditional grassland management has already vanished (such as large areas in Poland, Slovakia, Czech Republic, Hungary), the intention to preserve biological and cultural diversity faces different challenges. Those elements of traditional management must be identified which can be transplanted into the current conditions, practices and regulatory frameworks, and these elements of traditional management must be given high priority in subsidisation. It is of paramount importance that regulations encourage the practices aimed at enhancing small-scale spatio-temporal management variability, a typical feature of traditional grassland management. However, many elements of cultural diversity, strongly associated with traditional management can only be sustained in a limited manner. Assistance might be provided by the branding of products derived from traditional management, the organisation of festivals strengthening local identity etc. (Balczó et al. 2014).

If we manage to conserve the key elements of traditional grassland management, or replace them with new elements which are nevertheless successfully embedded in local landscape and culture, the preservation of the biological diversity of the cultural landscape could be secured, while the socio-economic system safeguarding local characteristics could be rendered more stable and resilient. Through this move both key segments of biocultural diversity could be reinforced. In our current case, hay meadows which lost their original function would not be subjected to spontaneous reforestation, or they would not be sustained only by completely artificial nature conservation management, which is not sustainable on the long term. Simultaneously with this achievement, local lifestyles and the associated social and cultural components would also be able to survive. In summary: biocultural diversity could be maintained.

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