The Role of Politics in the Life of a Conservation Incentive: An Analysis of Agri-Environment Schemes in Hungary

Abstract State-financed financial incentives are an increasingly popular tool for conservation on private lands. From policy and conservation perspectives, questions remain around the sustainability and longevity of behavioural changes associated with undertaking conservation work in exchange for payment. Further under-examined factors include inquiry into the role of the state as regulating agency, primary negotiator and enforcer, and how its politics and street-level relations influence participation. During 2015-6 a unique opportunity arose to investigate these issues as the Hungarian government unexpectedly cancelled its national agri-environmental programme to farmers. Through agricultural land use data, interviews and surveys (n=260), we analysed the consequences of the cancellation of cash payments on i) land use change, ii) farmers' maintenance of conservation activities and iii) farmers' relations with conservation actors. We demonstrate that withdrawal of conservation payments resulted in farmers cropping more intensively, with consequences for conservation agencies' relationships with farmers. Many farmers maintained a number of individual conservation rules despite not receiving payment. Measures associated with highest financial burdens and least apparent benefits were most likely to be broken, and several socio-ecological factors, including land use type (grassland or arable), farm size, and additional legal obligations (other subsidies and land leases) influenced farmers who desisted with specific conservation rules. Adherence arose from technological lock-in, perceived surveillance by state agencies, fear of retrospective sanction, and intention to re-apply. The Hungarian context underscores the relevance of accounting for multi-level politics and the ways in which these influence farmer-state relations in the day-to-day management of conservation incentive schemes.

1. Introduction

The use of financial incentives for conservation is widespread through both private and regulatory interventions (Pascual and Perrings, 2007; Narloch et al., 2011; Sattler and Matzdorf, 2013; Editorial, 2018). These incentives can usually be viewed as a type of payment for ecosystem service (PES): although they come in many forms, these incentives try to align individual land-user interests with broader community or public interests around the long-term preservation of the environment (Schomers and Matzdorf, 2013). Agri-environment schemes (AES) are a PES-like mechanism where payments to private landholders are tied to reducing negative environmental externalities associated with farming activities through farmers' adherence to less- intensive, environmentally- friendly practices through the transfer of public funds (Baylis, 2008). They are a popular means to increase the numbers of farmers engaged with conservation activities and agencies (Nelson, 2009), and the use of public money justified to "meet society's demand for environmental outcomes provided by agriculture" (EC, 2019). Understanding ways to enrol more farmers, and to pinpoint the factors that lead to effective participation, are central to research on AES (Allen et al., 2018; Moros et al., 2017; Reddy et

al., 2017), particularly as conservationists seek to ensure that direct payment schemes deliver environmental benefits (Ferraro and Pattanayak, 2006), modify social norms and secure long-term behavioural change (Snoo et al., 2012) - so that payments are not "money for nothing".

A number of outstanding questions remain with the design, negotiation and implementation of PES schemes, in particular around the sustainability or longevity and significance of behavioural change around conservation activities after the lapse of payments (Dayer et al., 2017), made relevant within a wider context of tightening public budgets (Horseman, 2018; McCarthy et al., 2012). As payments are typically made to overcome the economic opportunity costs of more intensive land use, economists expect that farmers will desist with conservation activities after payments end (Engel et al., 2008; Pattanayak et al., 2010), indicating that farmers have not significantly changed their livelihood strategies in response to conservation payments (Fisher, 2012), nor internalised conservation rules. This suggests that there is little farmer buy-in to mandated conservation activities, and that farmer collaboration is lost with the loss of funding.

Research attention has recently shifted to better understanding the importance of institutional design to PES schemes - namely, how key institutional players influence transaction costs, participation, possible spatial and ecological targeting and remit of programmes, and how multi-scalar institutions, from local to international, influence and secure effective and fair terms of contracts, implementation and enforcement (Corbera et al., 2009; Schomers et al., 2015). PES schemes tend to be complex, made up of myriad practical requirements from land use restrictions to administrative rules and timelines that may well be considered "mundane" administrative work (Jespersen and Gallemore, 2018). Many studies fail to account for the political, institutional and bureaucratic considerations that underlie the realisation of interventions and that give rise to a highly context-dependent "politics" of payment schemes (Milne and Adams, 2012; Walder and Kantelhardt, 2018). Participation and adherence to conservation rules are not necessarily binary, but occur along a spectrum, as adherence to particular rules occurs in relation to a number of different considerations, such as economic or labour-related consequences (Darragh and Emery, 2018), or the perception of surveillance and possible sanctions by state agencies (Kovács, 2015). This paper addresses these issues, as it investigates the larger politics behind the cancellation of a conservation incentive, how this cancellation affected farmers' decision-making around land use and conservation rules, as well as the relations between farmers and conservation agencies.

Agri-environment payments introduced to eastern Europe (EE) from the EU over a decade ago caused enormous upheaval to farming and conservation sectors (Sutcliffe et al., 2015; Mihók et al., 2017): previously abandoned land was brought back into cultivation (Biró et al., 2013) and land concentration accelerated (Kuemmerle et al., 2009; Griffiths et al., 2013). Subsidies to individuals and conservation interests on private land were novel to the region. The introduction of AES "re-territorialised" conservation interests (Adams et al., 2014), as new objectives, tools and formal state conservation actors were introduced and legitimised onto private land. Incentive schemes and their effects intersect with rural development realities and state institutional relations (Damiens et al., 2017), and the adoption of state-led AES are typically linked to a range of support services, such as farm extension networks, as well as intrinsic and extrinsic motivations and characters of farmers (Brown et al., 2019; Lastra-Bravo et al., 2015). The day-to-day running of the scheme requires that government agencies interface

at local levels with farmers, as they audit, inspect and undertake monitoring and evaluation of AES. In consequence, 'conservation' as realised is not an abstract undertaking but a set of institutional relations, where in EE state-citizen relations have their own historicity.

The EU's Common Agricultural Policy (CAP) is a state-directed mechanism that grants Member States significant discretion to design their own AES. This 'in-built' flexibility enables Member States (MS) to tailor AES to local, regional or national levels, so that schemes may target specific environmental objectives. These powers of decentralisation are likely to be increased in the future post-2020 CAP (Navarro and López-Bao, 2018). This proposed approach takes as fundamental the good governance characteristics of EU Member States, and that AES finance streams are relayed and designed with environmental and farmers' livelihood objectives in mind. This autonomy also makes it possible for MS to introduce sudden and drastic changes to their own AES systems in non-transparent and autocratic ways.

This paper draws from an analysis of a sudden and unexpected decision that arose in July 2014 when the Hungarian government cancelled all agri-environment payments that had been in place to farmers for over a decade (Magyari, 2014). An immediate effect of this decision was that almost 27,000 farmers lost access to subsidies worth over €45 million. Most studies that investigate individual preferences and decisions in the context of PES schemes are typically based on farmers' stated intentions rather than their real-time decision-making (Hayes, 2012; Kuhfuss et al., 2015), without meaningful engagement of social science-derived understandings (Bennett and Roth, 2018). However, the sudden and unexpected recall of the Hungarian AES scheme created a unique opportunity to examine these mechanisms through real-time evaluation of farmers' realised actions.

Making use of qualitative methods and grounded, long-term engagement, we seek to bring into conversation links between policy and a multi-level politics: from canvassing the effects of governmental decision-making on farmers' land use decision-making, to better understanding how payments and their governance affect farmers' relations and expectations of state agencies. This approach also draws inspiration from anthropological studies' tracing of the "social lives of things" (cf. Apparadurai, 1986 - in our case, subsidies), where seemingly objective 'things' are scrutinised for their socio-political relations, local importance and meanings.

To explore individual land use decisions following the cessation of the payments we performed a detailed farmer survey and interviews across three regions in Hungary. We laid particular emphasis on the following questions:

- Was there a significant change in farmers' management practices?
- What were farmers' attitudes towards the different components ('rules') of the AES regulations?
- What are the factors influencing farmers' rule-keeping behaviour, and thus determining the long-term societal influence of PES schemes?
- What were the overall consequences of the AES scheme hiatus in terms of land use and farmers' livelihoods?
- What can the year without AES reveal about relations between farmers and key institutional players?

Finally, we place our analysis within a wider political context and also provide a narrative description about the aftermath of this unique event in Hungary.

2. Methods

2.1. Hungarian AES and its political context

Agricultural subsidies, and thus direct payments for conservation in the form of AES, were introduced to EU EE accession states in 2004, where they were operational and extended in the intervening decade to 2014. At the Hungarian level, AES were designed (and payments calculated) to overcome farmers' opportunity costs and to target specific types of habitats and species (Ángyán, 2013). Formal governmental communications state that subsidies are to make up for "lost income, or in some cases compensation for incidental excess spending" associated with AES rule adoption (OMVK, 2014).

Application for participation in so-called 'horizontal' AES is open to any farmer, with any area of land. In the case of area-focused schemes ('zonal' programmes), farmers within territorially delineated areas may apply only. Most conservation-focused schemes fall within 'High Nature Value' (HNV) farming systems, where targeted conservation species require particular farmer activities to support the desired 'socio-ecological system'. It is these highly focused schemes that we investigate further below. Participation in AES is voluntary for farmers, with a minimum commitment period of five years. AES were delineated by the primary public conservation institutions in Hungary, made up of ten National Park Directorates.

Rural development programming periods of the EU are 7 years long, where the 2007-2013 financing period ceased at the close of the 2014 agricultural year (31 August). In the lead-up to this, the EC planned to significantly reform the structure of its direct payments, introducing multiple environmental conditionalities that would affect even basic area payments (termed 'greening'). As the financial deadline loomed, the EC acknowledged delays, and made available AES financing to all MSs in recognition of the late passage of the new CAP package. With this financing, it was the EC's intention that existing schemes would simply be extended to farmers, without causing any hiatus to farm-holders nor to ongoing AES programmes.

In this context, the Hungarian government was the only MS to not accept this extension, electing instead to cancel agri-environment payments outright, nation-wide. At the time, Hungarian decision-makers formally blamed financing delays at the EC level for the decision to cancel, taking no responsibility for the cancellation as a domestic, political one (Magyari, 2014; OMVK, 2014). There was no European response to this depiction; as outlined above, AES schemes are part of a flexible agricultural policy, and Hungary's decision to cancel its AES programme was treated as a domestic one without EU power of review.

2.2. Study area

We studied farmers and farming across three High Nature Value (HNV) area programmes: the regions were the Békés-Csanád plain, Heves plain and the Danube valley (Figure 1). The areas are lowland regions containing significant populations of the Great Bustard (*Otis tarda*), whose protection is a primary objective of the AES. For this reason, the specific measures as part of

AES available across all sites are the same. The AES schemes had been operational across these sites for a decade.

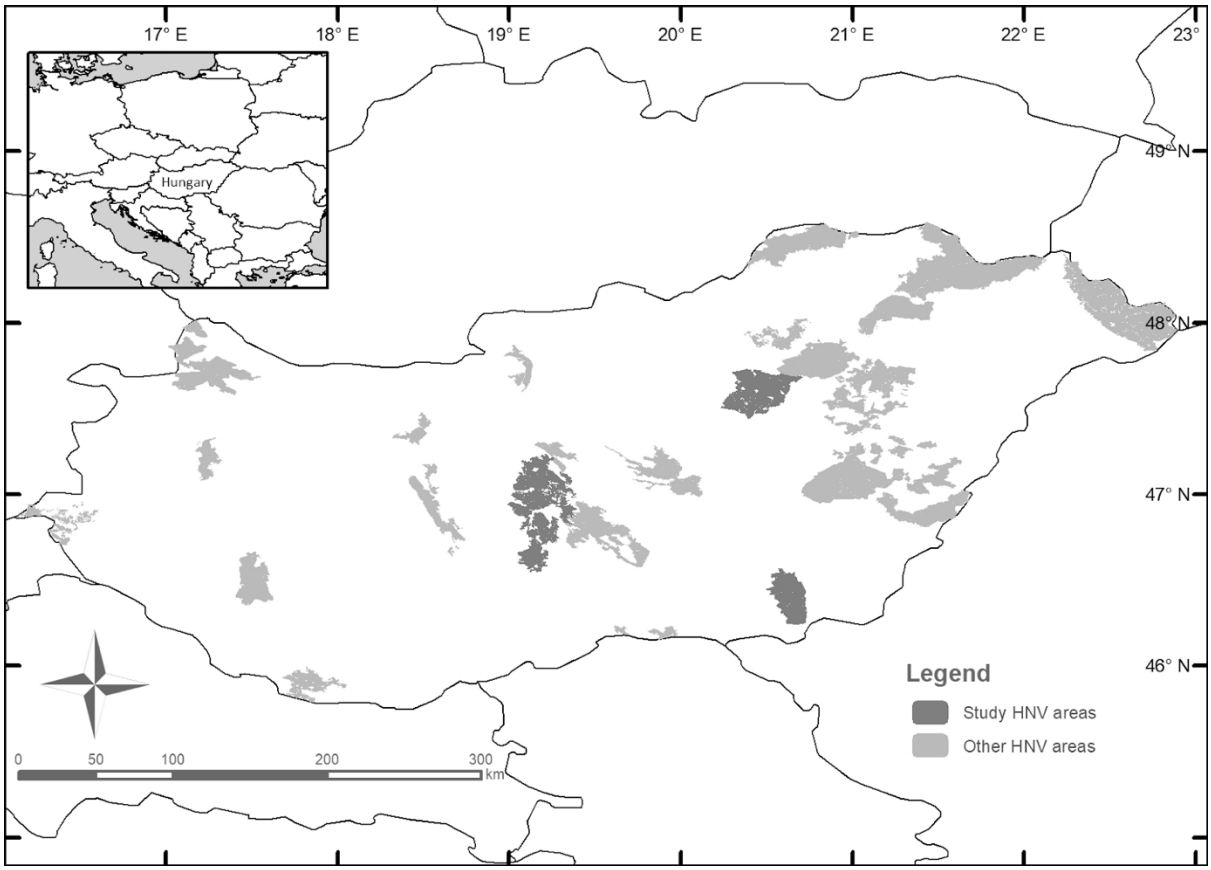

Figure 1. A map of all High Nature Value (HNV) sites in Hungary, and the three selected areas sampled.

AES programmes are made up of a number of rules that farmers are required to adhere to in order to qualify for AES payment (a description of all regulations can be found in Supplement 1). Farmers were surveyed for adherence to these rules as listed in Table 1. Administratively, an official farm year starts in September and ends in August of the following year. However, for the sake of simplicity we refer to a farm year by the second (main) calendar year it overlaps with, thus for example the farm year of the cancellation of AES in Hungary (Sep 2014 – Aug 2015) is referred to as 2015. AES were not re-introduced by the Hungarian government until May 2016, and as our interviews were also undertaken during this quarter, our dataset also consists of insight into the 2016 farming year.

Table 1: Selected key management regulations from the AES programmes studied in detail in this work, with the number of programme participants for each regulation. A full list of all management regulations can be found in Supplement 1.

Rule name/ Requirement	AES programme	Short description
r1 crop rotation	arable (n=209)	crop rotation compulsory: crops must include min. 20% cereal grains, 20% leguminous fodder, 20% green manure, 10% autumn rape, and max. 20% other crops
r2 wildlife chains	arable, grassland (n=245)	wildlife chains must be used on mowers
r3 mowing pattern	arable, grassland (n=245)	mowing direction must be from inside of the field outwards (termed 'bird-friendly' mowing)
r4 chemical application limits	arable (n=209)	soil sterilization and rodenticides prohibited, other pesticides allowed only in specific cases
r5 fertiliser limits	arable (n=209)	Nitrogen fertiliser application max 90kg/ha/yr
r6 livestock limits	grassland (n=123)	low-intensity grazing (0.2 livestock units/ha) must be maintained with cattle, horses, sheep or goats
r7 field margins	arable (n=209)	a 6-metre margin must be left free of all pesticides and herbicides, where only mechanical weed-clearing can take place
r8 mowing times	arable, grassland (n=245)	delayed mowing is permitted only after set dates specific to sites (between 15 June -15 July)

2.3. Survey approach and interviews

The design of surveys was preceded by a pilot study during September 2015 where survey questions were tested with six AES farmers. The eight examined rules (Table 1) were linked to discrete land management practices specific to achieving the conservation goals of HNV territories. Surveys were made up of three parts: A) farm-holding features and descriptors; B) development of farm-holdings over the past decade, farmer plans and aspirations; and C) the concrete land-use decisions brought during 2015. Farmers were surveyed through snowball sampling. Farmers who rented most of their lands from the local National Park or possessed

large hectarage of Natura 2000 were excluded, so as to be able to measure the degree of 'voluntariness' or selective participation with AES rules. The relevant parts of the surveys are provided in Supplement 2. The full surveys were completed by 4 pairs of trained surveyors between November 2015 and March 2016. To complement the surveys, interviews were undertaken with 20% of surveyed farmers from each area, in order to gain greater understanding of their experiences through this same time period and extending to April 2016.

Altogether 260 surveys were completed, where across the three case study areas significant percentages of farmers participating in AES schemes were surveyed, with 80% of total participants sampled from the Békés-Csanád plain, 40% from Heves plain and 24% from the Danube valley. Open survey questions and interviews were analysed through categorical coding as responses were elaborated to survey questions (survey questions are listed in Supplement 2). For example, several survey questions inquired into whether farmers were affected in particular ways by the payment hiatus as a binary question; if relevant ("yes"), follow-up questions as to how were recorded through open responses, which were then categorised as to type (see these break-downs in Supplement 4). Interview responses to these same questions were summarised to serve as examples of direct experiences and quotes representing these categories.

In addition to interviews with farmers, we completed 6 interviews with National Park rangers from across the three case study sites, and two interviews with workers from the governmental Agricultural Agency (AA). These interviews evaluated rangers' and AA perceptions of AES programmes in terms of their successes and failures; their impressions of farmers' views of conservation through AES on private lands; and their impressions of land use change and relational impacts between farmers and themselves as a result of the payment hiatus. Our analysis of these interviews were not to quantify views, nor to claim that they were representative of the whole ranger network; rather, our goal was to gain insight into otherwise undocumented informal relations, institutional and interpersonal experiences and processes that inform the AES programme's everyday functionality, and rangers' experience-based opinions on the effects of the payment hiatus on their relationships with farmers.

2.4. Household economies and land use

Direct land use impacts of the AES hiatus were quantified through detailed cropping data from the EU Integrated Administration and Control System (IACS) obtained through the Hungarian Agricultural and Rural Development Agency (*Mezőgazdasági és Vidékfejlesztési Hivatal*, MVH). We received data for three years (2013, 2014 and 2015) for all parcels that had been geographically eligible for AES subsidies in the three HNV study areas. From the parcel-level data we summarised the overall cropping areas for all non-cereal crops that were linked to the crop rotation rule (r1) of the arable AES (leguminous fodder crops, green manure crops, and autumn rape; Table 1), the two most important regional cash crops (corn, sunflower), and fallow areas (Table 2). Changes in the hiatus year were calculated with respect to the average of the two previous years as a baseline. The estimated impacts on farmer economies were quantified based on survey responses, which inquired after the percentage contribution of AES payments relative to net income in a financial year (we attempted more concrete estimations

through our pilot surveys but encountered high rates of response-refusal and reluctance due to the topic's sensitivity). Where farmers stated that they had experienced a financial loss that year as a result of the payment windfall, follow-up open questions were asked around how these shortages manifested in relation to their businesses that year (see questions B7, C2c, C3, C4, and C5 in Supplement 2). These free-style answers were themed and categorised (see Supplement 4 for categories and percentage-spread of responses).

2.5. Selective rule-keeping

The response variables used in this analysis describe the "rule-keeping" attitude of farmers during the hiatus year with respect to each rule. The farmers' responses to these questions (C2a.1-8 in Supplement 2) were coded as binary variables (r1-r8). There was also a more general question asked from farmers before going into the details of the individual rules: "Have you changed any of your management practices in 2015?" (question C1). This response was also coded with a binary response variable as per farmers' self-evaluation (r0).

We extracted from the surveys the following context variables presumably influencing the rule-keeping behaviour of the farmers as predictor variables:

- p1: the logarithm of the total area of the farm-hold cultivated (ha) by each farmer (extracted from survey question A1; transformed to a continuous variable with range [1.1 – 8.7]);
- p2: the ratio of grasslands vs. arable land in the farm-hold (A2.1; continuous [0 – 1])
- p3: an indicator showing if the farmer had areas rented/leased from a National Park (A2.11; binary);
- p4: an indicator showing if the farmer has some areas that belong to the Natura2000 conservation network (and received subsidies under this title; B3; binary);
- p5: an indicator showing if the farmer keeps livestock (horses, cattle, sheep) needing winter hay (A3; binary); and
- p6: an indicator saying if the farmer receives subsidies for plots in Less Favoured Areas (LFA; B3; binary).

Other subsidies in B3 were not considered as potential predictor variables, as there were either too few (forestry subsidies) or too many farmers that received them (single farm or area-based payments). All studied predictors were checked for multicollinearity using variance inflation factors (see Supplement 5).

We first tested a null hypothesis that there were no differences in keeping the various rules. We applied a binomial generalized linear mixed effect model (GLMM) with individual farmers' rule-keeping behaviour as the binary response. To do this we used only the records from those farmers who participated in both arable and grassland AES schemes (n=87). We merged all rules into a single binary response variable and used the rule ID (r1-r8) as the single categorical predictor, and the farmer as a random factor. We applied a logit link function and the Gauss-Hermite quadrature algorithm using R package *lme4* (Bates et al., 2015). There were no convergence issues (nAGQ=25). To formulate a hypothesis ("rule-keeping attitude is not

the same for all rules") we compared this model to a null model without the fixed effect using a Chi-square likelihood ratio test, and we also tested for over-dispersion (Pilowski, 2014).

After confirming that there is a significant difference between the rules, we went on to identify the differences between rules in a series of post-hoc tests, where we also added the farmer's overall self-evaluation (r0) to the set of rules. We refitted the GLMM model and compared the estimated marginal means of each rule with Tukey adjustments using the *emmeans* package (Lenth, 2018). Non-overlapping confidence intervals for the estimated marginal means of each rule were then interpreted as significant differences in rule-keeping behaviour.

After the tests demonstrating the differences in the level of adherence to the different rules, we continued by exploring the potential influence of the available predictor variables on these differences. We applied a new set of GLMM models (R package glmmTMB, Brooks et al., 2017) for this purpose. To each pair of predictor (p1-p6) and response variable (r0-r8) we fitted individual GLMM models that also contained the 3 study areas (region) as a random factor. For each rule we used only the records from the farmers who participated in a programme containing that rule (see Table 1). In the case of the self-evaluation (r0) we used all records. The degree to which the predictor is associated with the response was characterised with the p-values of the fixed predictor of the models (the probability that the predictor does not influence the rule-keeping, given the observed data). All calculations were performed in the R environment for statistical computing (R Core Team, 2018).

2.6. Motivations for dropping or keeping rules

Farmers' attitudes towards the AES schemes, as well as towards individual rules, were extracted from five free-text (interview) questions. The interview responses to these questions were categorised and coded using Excel. The most important recurrent replies and their prevalence are shown in Supplement 4.

3. Results

3.1. Hiatus' impact on land use and household economies

Based on survey results, one third (33%) of farmers stated that they farmed more intensively because AES restrictions did not apply to their land that year (where 'intensively' was defined by surveys as the leaving out of fallow rotations, and/or increased cropping with corn or sunflower). Different farming practices during the hiatus year was reflected in official agricultural statistical data (Table 2). The cessation of AES payments led to an increase in the area cropped with corn (17%) and sunflower (36%), which are two major 'cash crops' that were previously limited by the cropping restrictions (r1). The propensity of farmers to grow these crops during 2015 was underpinned by the area of perennial fodder crops (which used to be prescribed by the same rule, r1) falling drastically (42%) compared to the previous two payment years' average. The greatest decrease, however, was in green manure crops (also mandated by r1), which almost totally disappeared. In addition, a significant fraction of the

areas were left fallow with an almost five-fold increase compared to the average of the previous two years.

Table 2: Total area of main crops on AES-registered land across the three studied regions during the 2013-2015 period. Changes in the last two columns are relative to the 2013-2014 mean cover values of the crops.

	2013 *(ha)*	**2014** *(ha)*	**2015** *(ha)*	**change in 2015** *(%)*
fallow	2271	963	7476	**+362.2**
green manure crops	4414	4137	9	**-99.8**
corn	16808	15400	18901	**+17.4**
oilseed rape	5753	7957	6763	**-1.3**
perennial fodder crops	13652	13986	7924	**-42.7**
sunflower	14824	16015	20909	**+35.6**

In response to survey and interview questions as to the economic impact of not being paid AES payments during 2015-6, farmers stated that they forewent on average 27% of their expected incoming cash for that year (Supplement 4). Concrete financial consequences were reported to consist of five broad categories, from no modified investment or farm practice in response to the hiatus (37%), to a range of 'adaptation' strategies, from delaying farm investments (construction of stables, not purchasing or upgrading machinery; 32%), to 14 individuals (8%) undertaking drastic economic actions due to the hiatus, from taking on bank loans, declaring bankruptcy or ceasing operations, to selling livestock (Supplement 4). Furthermore, according to the interviews, half of the rangers and AA workers experienced that farmers held them personally responsible for the cessation of the scheme, even though both groups were equally uninformed as to the government's intentions around the AES cancellation.

Based on survey responses to whether farmers applied for AES participation with all their eligible land parcels from the three case study areas, 78% of otherwise eligible farmers within the case study regions elected to not participate in AES with some of their otherwise eligible parcels (see B7b in Supplement 4). The reasons farmers gave (to open questions) as to why they elected to hold back some parcels of land from participation ranged from wishing to withhold land as it was productive, such that they could maximise their yields (18%); as a result of administrative burdens of the AES programme (18%); because not all land in their ownership was eligible (13%); and because some farmers found the rules too difficult or

complicated in relation to specific parcels in question (5%); or because they had different intentions with the land, or did not want to keep livestock (5%; see Supplement 4).

3.2. Selective rule-keeping

To the summary question of whether farmers considered that their management practices had remained the same in 2015, 44% stated that they had farmed in the same way as in previous years, despite the lack of AES funding. When farmers were asked to detail their activities rule-by-rule, however, survey responses showed that in fact 71% of farmers did not maintain at least one AES rule (see Supplement 3).

Through questions pertaining to practices and attitudes towards individual rules, we found a highly significant difference ($p=2.2e-16$) in the degree to which the different rules were kept after the cessation of payments. The most frequently kept rules were wildlife chains and prescribed mowing directions, which were maintained by surveyed farmers with 90% probability. Grazing rates (87%) and fertilizer limits (71%) were still highly likely to be maintained, closely followed by three other rules from the arable AES programme (pesticide limits, crop rotation and field margins, all >50%). The most frequently disregarded AES restrictions were related to mowing and harvest times, which was kept with 30% probability (Fig. 2a).

The probability that a farmer would persist with AES rules in the hiatus year was influenced by several characteristics (Fig. 2b, Supplement 4). The total area of the farm-hold had a strong negative influence on the maintenance of restrictions related to mowing times, as well as to farmers' overall self-evaluation. Larger farm-holders were more likely to both change their farming practice and admit to having done so. The farm characteristic with the strongest predictive power was the proportion of grasslands in the farm-holding: farmers with more grassland kept almost all AES rules in contrast to farmers who cultivated mostly arable land. Land with a National Park lease was also more likely to be kept to AES practice. Surprisingly, farms in receipt of a similar subsidy ('least favourable area', or LFA payments) without the mowing rule were also less likely to maintain AES rules than those farms that did not receive this subsidy.

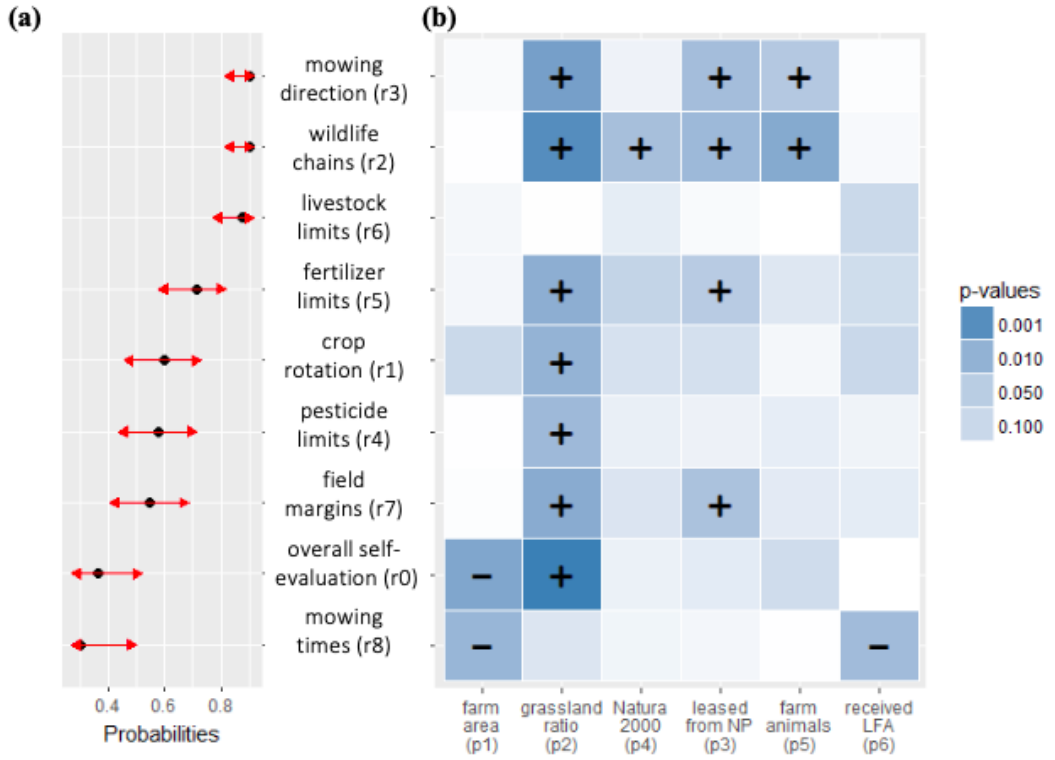

Figure 2: Estimated marginal mean probabilities that the studied AES regulations (r1-r8) were still kept after the halt of the scheme (a, non-overlapping arrows indicate significant differences), and the influence of a few selected factors (p1-p6) on these probabilities (b, darker colours indicate stronger relationships, and the direction of the strongest relationships is shown by +/– signs).

3.3. Motivations for keeping rules

Why this differentiation between rules? From interviews and surveys, farmers evaluated the rules that make up AES programmes individually: farmers generally did not judge AES programmes as a whole problematic, but had experienced difficulty with specific rules. When farmers were asked to list the most problematic AES rules based on their experience, 34% of farmers listed mowing time restrictions as most burdensome. Late hay-making reduced bales' nutrient value (with interviewees' stating, for example, that "bales become dry and worthless", full of weeds, and that "animals won't eat them") and increased the likelihood that farmers needed to buy winterfeed. Prescribed crop shares in the rotation were also a source of difficulty (17%), as fallow and green manure requirements were perceived as a waste of farm resources and opportunity. Chemical limits led to significant weed control issues on unsprayed field margins (15%). In the interviews farmers also expressed concerns that some conservation rules (e.g. r1, r7, r8) increased weeds and thus gave rise to an untidy or "wasted" appearance to the land, which they did not find aesthetically pleasing. And beyond all these rule-specific issues there existed a problematic 'paper/reality gap', where 45% of farmers stated that the bureaucracy associated with conservation payments was overwhelming to them, where paper/reality gaps referred to a state agency focus around paperwork rather than land-use based assessment.

As shown above, many farmers elected to maintain conservation rules during 2015 (and to Spring 2016) despite the lack of financial incentives. As a general explanation 22% of farmers expressed a form of 'technological lock-in' wherein their farming practices incorporated and accommodated AES rules as part of 'normal' or 'routine' practice, where, for example, "farming differently would require significant new investment." A similarly large subset of farmers (21%) mentioned that they agreed with some rules (mostly to fertiliser limits or mowing direction), stating that they would not farm differently anyway (a further 4% stated explicitly that conservation considerations motivated their participation). A quarter (25%) of farmers stated that maintenance of AES rules were in some way still not a question of free will: 14% of farmers stated that AES rules were lived as obligatory due to the presence of National Parks and Natura 2000 areas; 11% stated that future intentions to participate influenced them to maintain AES practice and they were concerned about retrospective sanctions.

Our surveys showed that 82.3% of farmers intended to re-apply to the AES programme in Hungary in 2016 (where intention to reapply varied from 74% in Bekes, to 85% in Heves and 89% in the Danube valley). Reasons for not planning to re-apply were divisible between those respondents who found the rules too strict (74%), and those who sought to farm more intensively without the strictures of the AES programme (18%, Supplement 4). We encountered 33% of farmers who responded to follow-up detail as to what was too strict about the programme relating this to its administrative (paperwork, reporting) expectations.

4. Discussion

4.1. Rule- keeping and its motivations

Cultural and social capacities for new norms are enormously geopolitically variable (Burton and Paragahawewa, 2011). For farmers whose identities are often defined by productivist values prioritising yields, profits and production capacity (Thompson et al., 2015), the perceived and experienced potential of land and soil to yield crops also mitigates willingness to 'be green'. Our work underscores these relationships through both the selectivity with which farmers nominate AES participation with only particular land parcels, and their utilitarian and pragmatic approach to individual conservation rules. While environmental values have been advocated as relevant to understanding farmer willingness to participate in conservation (Vuillot et al., 2016), our results show that such arguments only provide motivation for rule-keeping in the case of easy (or low cost) rules with an apparent benefit, and furthermore, that farmer participation is not binary, as some rules were kept and others desisted with. Environmental concerns motivated only a relatively small number (12%) of our farmers, indicating a lack of intrinsic motivations to be crowded out (Rode et al., 2015).

The cessation of AES after a decade enabled novel insight into the relative importance and socio-economic impact of these conservation payments. We found that a majority of farmers started re-cropping more intensively when they realised there would not be any surveillance or payment during the 2014-16 agricultural years. However, a surprising number of farmers did keep to some rules of the AES programme, from reasons of technological lock-

in, willingness to reapply, non-difficulty of rule adherence or apparent and directly attributable environmental benefits. Maintained rules were viewed as 'good practice' even during the hiatus; for example, the rule prescribing bird-friendly mowing (r3) that comes with very obvious and tangible benefits (avoided bird kills) was maintained by 73% of the farmers in our study, often supported by a moral justification ("*I'm not going to kill birds just because we're no longer getting payments!*"). This may also be true for rules with some initial investment cost, such as wildlife chains (r2), which farmers found required an insignificant amount of "extra effort" once they possessed the necessary equipment.

Rules that were seen to create a loss in the farm economy were more frequently dropped as soon as not legally prescribed. This is well evidenced by the change to more intensive cropping: farmers cropped more sunflower and corn at the almost complete expense of legumes and green manure crops. Chemical limits imposed on cropping (r4, r5) also directly influences possible attainable yields, which led to their greater use in the hiatus year. AES rules that incurred an apparent loss (opportunity cost) were experienced by farmers as a degradation of their work, such as late mowing times (r8) for hay-bales, or green manure crops (r1), wherein farmers often undertake the performance of labour for no readily apparent return, also diminishing their symbolic capital (Burton et al., 2008). Farmers also expressed that conservation rules prescribing fallow and green manure crops (r1), and those that increased weeds, such as field margins (r7) and late mow times (r8), gave rise to adverse outcomes (weeds), "wasted" land, or did not look aesthetically pleasing. Indeed, others have found that negative experiences and disagreement with conservation activities give rise to lower persistence intentions (Kuhfuss et al., 2015; Kwasnicka et al., 2016; Stern, 2006).

The factors behind the adherence to regulations may also be predicted through a number of farm characteristics. Larger farms (p1) and those with greater arable hectarage (p2) had more options to alternative strategies (e.g. cash crops) to make up the financial gap left by financial incentives in the hiatus year. Farms characterised by livestock (p5) and grasslands (p2), with grassland leased from a neighbouring National Park (p3), seem more locked into a particular way of farming, with fewer adaptation options. Nevertheless, the traditional pastoral grazing typical of these regions (and also prescribed by the grassland AES) also suggest a closer connection with traditional land use for farmers. It is important to notice that this group of farmers had a significantly higher (almost complete) internalisation rate for the 'easy rules' (r2, r3). Adherence to conservation rules as a result of National Park leases also arose from a perception of surveillance and oversight, and a fear that rule-breaking behaviour could be sanctioned retrospectively in the case of an eventual continuation of the programme. This is underlined by the interview results, where approximately a quarter of the farmers expressed either of these issues as a concern. Achieving persistent conservation-friendly practice from participants requires, thus, a complex understanding from regulators of both individual economic farm-hold contexts (Ahnström et al., 2009), as well as broader scale political drivers and interactions that influence farmers' decision-making (Siebert et al., 2006).

Our results indicate, therefore, that there is a maligned theory from designers of financial incentives who expect financial instruments to serve as a kind of sponsored 'learning process', which arises from a misapprehension of what influences the decision-making of participants. According to farmers AES payments were indivisible from other agricultural subsidies, as they made no practical differentiation between sources of cash flow (i.e. "all

payments go to the same place"). While AES incentives compose a significant proportion of farmers' income, this underscores farmers' conceptions of AES as income supplements rather than compensation for income foregone, making more difficult the explicit maintenance of financial incentives with a conservation identity. The administrative rather than environmental emphasis in the way AES are run means that the programme resembles a 'check box' of rules to farmers rather than a method for developing environmental awareness amongst participants.

4.2. Environmental consequences of AES hiatus

AES has been designed to make a significant impact on the environment. Not surprisingly, farmer abstention from complying with AES may also give rise to a number of environmental consequences. The most conspicuous changes during the 2015 farming year were around the level of crop choice and land use, which had been directly constrained by AES regulations. Rule r1 makes crop rotation compulsory, and caps the percentages of particular crops allowed within any one land-holding, and prescribes minimum amounts for some other crops and land uses. On the one hand, increases in cropped areas of corn and sunflower on AES-registered land, and their attendant pesticidal and fertiliser inputs, signify environmentally detrimental outcomes to areas that have been under 'environmentally-friendly' land management use for a decade. This shift is accompanied with an almost complete disappearance of green manure crops, and a drastic (~50%) reduction in perennial fodder crops. This second change is even more severe considering that these crops are intended to be perennial, with the most widespread, alfalfa, having a typical turnover of 4-5 years. Therefore, the fact that almost half the perennial fodder crops were abandoned from one year to the next suggests that many of these fields were in fact prematurely abandoned.

Our results in Table 2 also show an extreme (nearly fivefold) increase in the amount of fallow area during 2015, which might be considered positive from the perspective of biodiversity. The significance of this increase is, however, nuanced by the fact that it started from a relatively low basis. Fallows are particularly sensitive regulatory changes (Griffiths et al., 2013; Levers et al., 2018). It is not uncommon that abandonment and intensification take place at the same time in the same region (Levers et al., 2018). In this case the simultaneous presence of these two opposite processes might also be traced back to the diverse individual situations in which farmers suddenly found themselves after the cessation of AES payments. While some farmers were forced to give up some of their activities, others adapted by farming more intensively, thus compensating for the loss of AES income. In fact, the trends depicted in Table 2 suggest that intensification was stronger than extensification in this case.

The particular issues highlighted around farmers and mowing times may also have consequences for the target species of AES, the Great Bustard. Until 2014, payments compensated farmers from mowing at times when these ground-nesting birds were sitting on eggs or raising young and grazing on rapeseed or lucerne. Although most farmers maintained rules if they perceived birds to be present, we did encounter a number of individuals (n=5) who had explicitly stated in interviews that they would not (e.g. "*as my contract has not been renewed, I will do what makes absolute sense for me, and I will retrieve my haybales and mow when it suits our farm*" – also see Hardi, 2016). Part of AES schemes' outreach on behalf of

conservation agencies included information around how crops and land-management timings worked such that these benefitted sensitive species: the long-term loss of these activities from the landscape may translate, in time, into detectable bird and other target species' declines.

4.3. Politics of payments

Interviews with rangers from National Park Directorates and interviewees from the Agricultural Agency highlight a loss of trust between farmers and state agencies as a result of the lapse in the AES programme. For example, from our six ranger interviews, all expressed that farmers were generally "without trust" towards them (*bizalmatlanok*), but that these relations had worsened because of the unexpected cancellation of the programme. Two workers recounted how they had promoted the AES programme through a series of country-wide workshops, during which they encouraged farmers to apply to zonal conservation schemes and assured them of their selection ("we told them that everyone who applied would get into the programme"), as applicants willing to participate in conservation schemes (alongside the more usual area-based subsidies) would be "privileged" when applications were assessed. These workers stated that they "fell on their faces" when AES was not renewed. All rangers and AA workers stated that they did not have prior information about the programme's cancellation, a decision that was made by the central government. Despite this, four interviewees stated that they experienced that farmers held them personally responsible, as they had received accusations of having deliberately misled and misinformed.

The cancellation of AES affected farmer-conservationist relations, where rangers emphasised that the hiatus in the programme also led to lost opportunities to meet and interface between farmers and conservation practitioners, and that face-to-face relations typically "temper and improve" farmers' perceptions of conservation, and give the conservationists an opportunity to account for and explain the need for particular AES rules. Relations of mistrust between farmers and state agencies also provide insight into why a large proportion of farmers adhered to AES rules despite not receiving payment: these behaviours may be underpinned by surveillance experiences and administrative expectations. For example, the relatively high share from our farmer sample, a quarter (25%) of farmers stated that AES rule maintenance was still not a free decision: 14% stated that AES rules were lived as obligatory due to the presence of National Parks and Natura 2000 areas (stating e.g. for example, that "*National Parks are always here with their vehicles and binoculars*"). These responses underline that the AES programme is experienced by these farmers as 'top-down' conservation. 11% of farmers stated that future intentions to participate influenced them to maintain AES practice, as they were concerned about retrospective sanctions in a year in which they did not maintain AES rules. These results thus also emphasise how the behaviour of conservation workers and the ways in which laws and regulations are enforced influence farmers' behaviour.

4.4. Epilogue: the aftermath of the AES hiatus in Hungary

As reported above, over 82% of farmers intended to re-apply to the AES programme in 2016. However, formal politics again intervened. Applications for the 2016 AES round were not

announced until May 2016, well after the required sowing period for the majority of crops. In May 2016 the Hungarian government made apparent significant down-scaling to the AES programme (Figure 3), which resulted in AES for the 2016-2020 period operating at less than 50% of their pre-hiatus support levels (at the Békés- Csanád HNV area this is as low as 10%).

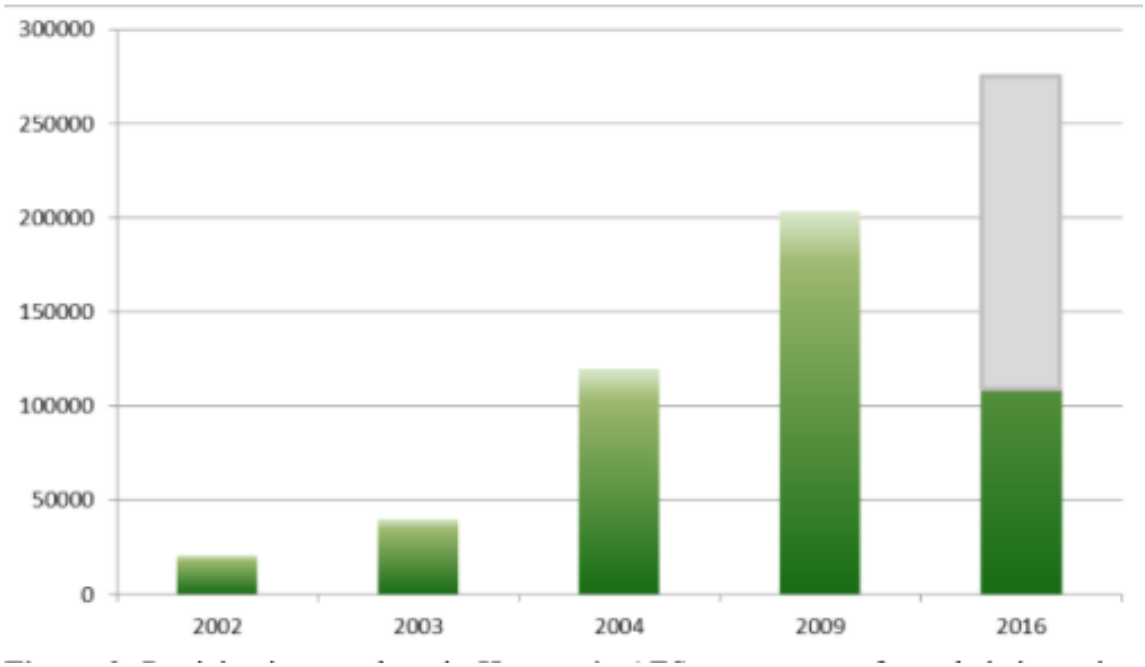

Figure 3: Supported farmer numbers through the Rural Development Programme (RDP) cycles to date (2002; 2003; 2004-9; 2016-2021). The green columns signify the numbers of supported farmers in AES country-wide; the grey column in 2016 represents the number of applicants, the green the selected for participation/funding. Source: Ministry for Agriculture 2016.

The national-level decision to cancel AES in 2014, and the subsequent cuts brought to the programme, cannot be separated from wider Hungarian land politics that took place at this time. From 2014, publicly owned agricultural land leases expired. Soon thereafter, the Hungarian government announced the privatisation of 350 000 hectares of publicly owned land. Interviews conducted with workers from agricultural and conservation agencies suggest that land sales and the cancellation of the national AES programme were not coincidental: as AES participation requires land use certificates and certainty of ownership for five years, the lack of AES contracts meant that land was not contractually 'tied down', and land sales could proceed with diminished pre-emptive rights claims (as there were no existing tenancy or land use agreement). This was the start of what other authors have exhaustively catalogued as a nepotistic state-led land grab that resulted in land leases and then land sales being allocated to the politically connected over local farmers (Ángyán, 2016).

In consequence, rangers from across our case studies highlighted that a number of farmers who had undertaken AES land management on leased public lands also lost their access. Wider land tenurial change and increased land concentration through non-transparent land sales and access allocations, which typically excluded local smallholders, formed a core part of farmers' realities during this period (see Kovacs, 2019 for more detail). The ways in which these broader political contexts and historical state-citizen relations and arising attitudes,

perceptions and customs with formal state agencies influence individual farmer behaviour is under-explored in the literature on the use of incentives for conservation, despite the rise (or the return, in a post-socialist context) of the surveillance or authoritarian state. In studies with farmers, understandings of behaviour are more typically examined in the realm of individual motivations and the role of social networks.

5. Conclusions

Our study provides insight into the complex decision-making that participants undertake when they elect (or not) to join a financial conservation incentive programme, and uniquely, also unpacks the internal heterogeneities of rules that make up schemes. We found that farmers evaluated rules predominantly around two major characteristics: (1) whether rule application incurred any direct physical costs (including apparent losses or opportunity costs), and (2) whether rules led to environmental benefits that were apparent and directly attributable. Environmental concerns motivated only a few farmers.

Our results indicate, therefore, that expectations that financial incentives can serve as a sponsored 'learning process' and modify social norms were not met. Payments' adoption and corresponding behavioural change are the outcome of complex considerations, where institutional pressures (and support structures), a multi-level political context and arising farmer-state relationships all have considerable roles in influencing farmer buy-in and willingness to participate in conservation programmes. Further attention is required to the day-to-day negotiation and institutional 'place' of incentive programmes, particularly to historically contingent and rapidly changing norms around citizen-state relations in a context where most PES incentive schemes are state-led (Schomers and Matzdorf, 2013).

Insufficient inquiry has been granted thus far to state-led intervention models, tactics and interests. For example, historical legacies of mistrust and state (over-)surveillance, as well as broader domestic politics (such as the rhetorical politicisation of financial sources and internal land allocation processes) have far-reaching consequences for conservation, despite efforts to depict PES as somewhat apolitical programmes with technical demarcation and opportunity-cost-based payment design forms. This gives rise to several missed opportunities that affect the sustainability of PES schemes and their longevity, such as insufficient farmer buy-in and understanding of measures' effects on biodiversity or the wider environment (Babai et al., 2015), and persistent under-explored gaps between PES objectives and outcomes of implementation (He and Lang, 2015). Conservation cannot be spatially nor economically siloed from broader politically- or economically- motivated trends around land law and tenure changes.

While institutional support, awareness and capacity-raising are all needed to foster environmental stewardship (Selinske et al., 2017), conservation policy tends to be undertaken in an hierarchical, top-down fashion with few relationships or feedback mechanisms in place (Turnhout et al., 2012). This is certainly the experience with the AES programmes studied here, where bottom-up approaches were not developed that incorporate farmers' views on individual conservation measures, nor in the development of the objectives of these schemes. Crucially, the operation of conservation incentive schemes, particularly in marginal, rural or remote

places, may be the one consistent formal 'interface' through which farmers interact with formal government agencies. Any abrupt changes to the operations of payments in these contexts - without justification or communication - potentially translate into the loss of support not only for conservation farming, but also from individuals and their already-marginal businesses. It is thus important to recognise the multi-faceted nature of conservation payments, from their political role and place to their socio-economic 'lives', to be able to holistically understand and assess farmers' motivations for participation.

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Supplement 1: A summary of all regulations involved in studied AES programmes

AES1: Arable cropping rules for development of Great Bustard habitat

Administrative and general requirements:

- parcels must be registered and measured out as under arable cultivation by the Land Registry;
- parcels must be 0.3-75 ha, with minimum support size set at 1ha;
- valid land use certificates must be demonstrated for the entire programming period (2009-14);
- a daily farm management log diary must be kept;
- soil examination, soil nutrient report must be made by an expert in the first and last year of participation, on the basis of which a yearly soil nutrient plan must be written and followed;
- land use plan describing crop rotations for every year of the programme must be prepared and made available;
- completion of two education training programmes in 5 years on agri-environment.

Land use rules:

- crop rotation must be adhered to; main crops must include min. 20% cereal grains, 20% leguminous fodder, 20% green manure, 10% autumn rape, and max. 20% other crops;
- applied fertiliser never to exceed 90 kg/ha/yr Nitrogen;
- only environmentally-friendly grade plant protection products may be used;
- a 6 m wide strip must be left free from all pesticide and herbicide treatments, where only mechanical weed-clearing may take place as necessary;
- 5-10% of rapeseed crops must be uncovered from snow during winter;
- for perennial fodder crops nutrient application is forbidden save at sowing and additions, when fertilisers must not contain more than 90 kg/ha/yr Nitrogen;

- amelioration, irrigation is not permitted;
- night work prohibited between March and July;
- sewage, slurry, sludge prohibited;
- soil disinfectants, rodenticides entirely prohibited;
- insecticides prohibited, except in rapeseed and mustard and oilseed radish;
- if found, endangered ground-nesting birds must be immediately reported to National Park offices, and a detailed action protocol must be followed.
- At mowing:
    - mowing requests must be made to National Park offices in writing at least 5 days in advance;
    - bird-friendly mowing practices must be used, which means that farmers must mow in a circular direction starting from the middle of the field and work outwards.
    - wildlife chains must be used on mowers
    - 5-10% of land must be left unmowed;
    - mowing must occur in two phases: the first half (at least 50%) of the crop must be mowed after 15 June, and the first half must be mowed before 25 April (such that no land use activity occurs between 26 April – 14 June so as not to disturb groundnesting birds); at Danube Valley HNV the earliest mow can occur only after 30 June 2

AES2: Grassland management for Great Bustard habitat development

Administrative requirements:

- parcels must be under grassland cultivation;
- parcels must be at least 0.3 ha, with minimum supported land area 1ha;
- land use certificate validity must be demonstrated for the entire programming period (2009-14);
- a daily farm management log diary must be kept;
- completion of 2 education training programmes in 5 years on agri-environment.

Land use rules:

- 0.2 livestock/ha grazing must be maintained with cattle, horses, sheep or goats, which must be formally registered;
- overgrazing is forbidden; pastoral or sectional grazing to be used; electric fencing only with the permission of authorities;
- seeding, irrigation, spiking, ventilation of grassland forbidden;
- chemical weed killers, all artificial fertilisers (apart from manure originating from grazing animals) are banned;
- National Parks may map a max. 50% of participating grassland area as Great Bustard habitat, where grazing is only allowed after 31 May;
- in the case of meadows without grazing, an autumnal clean mow is compulsory;
- haybales must be cleared within one month from grassland;
- if found, endangered ground-nesting birds must be immediately reported to National Park offices, and a detailed action protocol must be followed.
- At mowing:
    - mowing permitted once per year;
    - all mowing activities must be registered to National Parks offices at least 5 days prior to their start date in writing;
    - bird-friendly mowing practices must be used, which means that farmers must mow in a circular direction starting from the middle of the field and work outwards;

- wildlife chains must be used on mowers
- 5-10% of grassland must be left unmowed;
- the year's first mow must take place before 25th April on 50% of registered land in the programme, with the other half mowed only after 15 June. At Danube Valley HNV the earliest mowing may occur only after 30 June.

Supplement 2: Structure of field surveys and general overview of quantitative outcomes

Part A: Descriptive factors of farm-holding

A1 How large is the farm-holding? [number (ha)]
A2.1 How many hectares are arable? [number (ha)]
A2.2 How many hectares are grassland? [number (ha)]
A2.11 Do you have a lease for land with the National Park? [binary (y/n)]
A3. What livestock do you possess? Enter number of animals:
A3.1a Cattle for beef [number]
A3.1b Cattle for dairy [number]
A3.2 Sheep [number]
A3.3 Goats [number]
A3.4 Poultry [number]
A3.5 Horses [number]
A3.6 Pigs [number]
A3.7 Other (specify!) [free text]

Part B: Agri-environment (AES) baseline

B3 What other subsidies and programmes did you receive support for?
B3.1 Area-based [binary (y/n)]
B3.2 Natura 2000 [binary (y/n)]
B3.3 Livestock [binary (y/n)]
B3.4 Forestry [binary (y/n)]
B3.5 Less favoured areas [binary (y/n)]
B3.6 Other (specify!) [free text]
B6 Why did you elect to participate in AES? [free text]

B7 Do you participate in AES with the whole area of your farmholding? [binary (y/n)]
B7b If you do not participate with the whole area of the farm, why not? [free text]
B14 Which rules caused significant problems with implementation? [free text]

Part C: The hiatus year

C1 Did you farm differently on AES areas this year, now that there was no AES support? [binary (y/n)]
C1b If not, why not? [free text]
C2a Which rules did you maintain this year?
C2a.1 Cropping rotation [binary (y/n)]
C2a.2 Wildlife chain [binary (y/n)]
C2a.3 Bird-friendly mowing [binary (y/n)]
C2a.4 Chemical input limits [binary (y/n)]
C2a.5 Fertiliser restrictions [binary (y/n)]
C2a.6 Livestock density numbers [binary (y/n)]
C2a.7 Chemical-free field margins [binary (y/n)]
C2a.8 Required mowing practices [binary (y/n)]
C2a.9 Other (specify!) [free text]
C2b Why did you keep to these rules? [free text]
C2c Did you undertake any farm activity this year that you could not previously undertake because of AES? [binary (y/n)]
C2c.b If yes, what was this? Why? [free text]
C3 Estimate what percentage of your incoming yearly cash do AES payments normally compose?
[number (%)]
C4 As a result of not receiving AES support this year, did you make any decisions that will affect the long-term functioning of the farm? [binary (y/n)]
C4b If so, what are these? [free text]
C5 Even though there was less incoming financial support to your farm this year, were there any advantages to there being no AES programme this year? [binary (y/n)]
C5b If yes, what were these? [free text]
C6 Do you plan to re-apply to the program if it will be reopened? [binary (y/n)]
C6b If not, why not? [free text]

Supplement 3: The observed means of rule-keeping behaviour

The share of AES participants per case study region, who adhered to the rules after the cessation of the payments (observed means)

Rule name		Heves plain	Békés-Csanád plain	Danube valley	All three regions
r1	**crop rotation**	40.7%	45.5%	66.2%	50.7%
r2	**wildlife chains**	70.1%	58.0%	86.0%	72.3%
r3	**mowing pattern**	70.1%	60.9%	84.9%	72.7%
r4	**pesticide limits**	50.6%	45.5%	47.9%	48.3%
r5	**fertilizer limits**	55.6%	60.0%	57.7%	57.5%
r6	**livestock limits**	61.5%	92.3%	82.0%	79.6%
r7	**field margins**	51.9%	27.8%	52.1%	45.6%
r8	**mowing times**	44.4%	46.2%	49.3%	47.8%
r0	**self evaluation**	39.8%	36.2%	53.4%	43.7%

Supplement 4: Quantitative outcomes of farmhold survey

The topics identified in the textual analysis (coding) of questions B6, B7b, B14, C1b, C2b, C4b, C6b; and the mean responses to the numeric question C3.

N: the number of farmers who mentioned the topic,
P: the prevalence of the topics (their percentage among all valid responses to the question).

	N	**P**
hy did you elect to participate in AES? (B6)		
To maximize income ["pénz miatt"]	130	51%
Reasons of money and land	42	16%
Money and conservation	16	6%
Motivation a combination of money and other reason	65	25%
Agreement with nature conservation goals ("természetvédelmi szempontok miatt")	10	4%
Friends, neighbours (have also entered) ("az ismerőseim, szomszédaim is beléptek")	5	2%
Land (is marginal) ("rossz földek")	17	7%
Ease of compliance ("könnyű")	7	3%
Out of obligation (non-voluntary due to other obligations) ("kötelező")	22	9%
ou do not participate with the whole area of the farm in AES, why not? (B7b)		
To maximize yield ("több/jobb termés, más termények")	45	18%
personal goals ("nem úgy akarta használni a földjét, nem akart állatot")	13	5%
administrative burdens ("papírmunka, ellenőrzés, osztatlan közös komplikációk")	45	18%
complicated rules ("bonyolult/nehéz szabályok")	13	5%
some land was not eligible ("nem volt kijelölve az AKG programba")	33	13%

d you farm differently on AES areas this year, now that there was no AES support? If not, why not? Why did you keep to these rules? (C1b & C2b, the answers were processed together)		
obligation (contracts with National Park or land delineated as Natura2000) ("kötelező")	35	14%
future plan to participate (and retrospective legislation is possible) ("folytatni szeretné")	27	11%
agreement with rules ("egyetért")	51	21%
routine, lock-in ("beállt rutin")	55	22%
organic farming ("biogazdálkodás")	3	1%
ease (of specific rules) ("könnyű")	4	2%
Combination answer given	11	
hich rules caused significant problems with implementation? (B14)		
chemical limits (r4, r5) ("műtrágya, növényvédelem")	37	15%
mowing times (r8) ("kaszálás ideje")	84	34%
general disagreement (with AES) ("nem így kellene")	30	12%
crop rotation (r1: crops that were not allowed) ("vetésforgó, kukorica, napraforgó")	25	10%
bureaucracy ("papírmunka, ellenőrzés")	37	15%
rule inflexibility ("rugalmatlan")	28	11%
mandatory fallow/ green crops (r1) ("zöldtrágya, ugar")	22	9%
mandatory border markers (that disappear from the field, making it impossible to meet administrative expectations) ("határjelzők")	6	2%
hat percentage of your incoming yearly cash do AES payments normally compose? (C3)	181	27%
a result of not receiving AES support this year, did you make any decisions that will affect the long-term functioning of the farm? If so, what are these? (C4b)		
no change	66	37%
made up for windfall	34	18%
delayed on-farm investments	59	32%
took on bank loan	6	3%
bankruptcy, ceased farming	4	2%
sold livestock	4	2%
Why don't you plan to re-apply for the programme (if it will be reopened)? (C6b)		
Because the programme was too strict	28	74%
Intends to farm more intensively than the programme allows	7	18%
Other reason (personal health, circumstances)	3	8%

Supplement 5: Details of statistical models fitted

Anova table for the global test

- *null hypothesis: there were no differences in keeping the various rules;* `m0: value ~ 1 + (1 | fID`,
- *alternative hypothesis: the level of adherence to the different rules is not the same* `m1: value ~ rule + (1 | fID)`

where `value`: *binary rulekeeping outcome (1: rule was kept, 0: it was not kept);* `rule`*: rule ID (r0-r8),* `fID`*: farmer ID (random factor)*

```
> # the difference between the null and the alternative models
> anova(m0,m1)
Data: dd
Models:
m0: value ~ 1 + (1 | fID)
m1: value ~ rule + (1 | fID)
   npar    AIC   BIC  logLik deviance  Chisq Df Pr(>Chisq)
m0    2 882.82 892.0 -439.41   878.82
m1   10 788.70 834.6 -384.35   768.70 110.12  8  < 2.2e-16 ***
---
  Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

The details of the fitted GLMM model
(all rules are compared here to r0, the self-evaluation of the farmers)

```
> summary(m1)
Generalized linear mixed model fit by maximum likelihood (Adaptive Gauss-
Hermite Quadrature, nAGQ = 25) ['glmerMod']
 Family: binomial  ( logit )
Formula: value ~ rule + (1 | fID)
   Data: dd
```

```
      AIC      BIC   logLik deviance df.resid
    788.7    834.6   -384.3    768.7      718

Scaled residuals:
    Min      1Q  Median      3Q     Max
-4.9965 -0.5597  0.2366  0.5045  3.3576

Random effects:
 Groups Name        Variance Std.Dev.
 fID    (Intercept) 3.024    1.739
Number of obs: 728, groups:  fID, 87

Fixed effects:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)  -0.5596     0.3329  -1.681  0.09280 .
ruler1        0.9533     0.3885   2.454  0.01413 *
ruler2        2.7920     0.4475   6.239 4.41e-10 ***
ruler3        2.7920     0.4475   6.239 4.41e-10 ***
ruler4        0.8808     0.3878   2.271  0.02315 *
ruler5        1.4690     0.3963   3.706  0.00021 ***
ruler6        2.4900     0.4375   5.692 1.26e-08 ***
ruler7        0.7534     0.3881   1.941  0.05222 .
ruler8       -0.2996     0.4559  -0.657  0.51107
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Correlation of Fixed Effects:
       (Intr) ruler1 ruler2 ruler3 ruler4 ruler5 ruler6 ruler7
ruler1 -0.583
ruler2 -0.520  0.473
ruler3 -0.520  0.473  0.465
ruler4 -0.584  0.518  0.471  0.471
ruler5 -0.576  0.517  0.483  0.483  0.516
ruler6 -0.529  0.478  0.462  0.462  0.477  0.487
ruler7 -0.582  0.515  0.464  0.464  0.514  0.511  0.471
ruler8 -0.490  0.416  0.352  0.352  0.417  0.404  0.360  0.418
```

Estimated marginal mean probabilities for each rule,
Including confidence intervals (asymp.LCL: lower, asymp.HCL: higher)

```
> m1 %>%
+  emmeans(~rule, weights="proportional") %>%
+  summary(type="response")
 rule  prob     SE  df asymp.LCL asymp.UCL
 r0   0.364 0.0770 Inf     0.229     0.523
 r1   0.597 0.0801 Inf     0.436     0.740
 r2   0.903 0.0346 Inf     0.811     0.953
 r3   0.903 0.0346 Inf     0.811     0.953
 r4   0.580 0.0810 Inf     0.418     0.726
 r5   0.713 0.0697 Inf     0.560     0.829
 r6   0.873 0.0426 Inf     0.764     0.936
 r7   0.548 0.0825 Inf     0.387     0.700
 r8   0.297 0.0862 Inf     0.159     0.487

Confidence level used: 0.95
 Intervals are back-transformed from the logit scale
```

Variance inflation factors of the predictors (values above 5 should indicate considerable collinearities)

```
       p1       p2       p3       p4       p5       p6
1.149927 1.506325 1.508447 1.297211 1.340437 1.185657
```

The details of the GLMM models used for assessing the degree of association between each response (r0-r8: adherence to the individual rules) and each predictor (p1-p6; see Fig 2 in the main paper).

Model specifications			Random effect (region)		Fixed effect (predictor)			
Response	**Predictor**	**n**	**Variance**	**Std.Dev.**	**Estimate**	**Std.Error**	**value**	**Pr(>|z|)**
r1	p1	107	1.53E-01	3.92E-01	-0.181	1.12E-01	-1.615	0.10636
r1	p2	104	5.48E-02	2.34E-01	1.398	5.16E-01	2.269	0.02325
r1	p3	133	1.05E-09	3.25E-05	0.684	3.89E-01	1.757	0.07892
r1	p4	98	1.70E-01	4.12E-01	0.434	3.17E-01	1.369	0.17093
r1	p5	107	1.68E-01	4.10E-01	-0.158	3.09E-01	-0.510	0.61020
r1	p6	106	1.01E-01	3.18E-01	0.476	3.01E-01	1.583	0.11346
r2	p1	142	3.04E-01	5.52E-01	0.006	1.19E-01	0.050	0.95992
r2	p2	139	1.24E-01	3.52E-01	2.072	5.19E-01	3.349	0.00081
r2	p3	156	2.83E-01	5.32E-01	1.142	4.67E-01	2.444	0.01451
r2	p4	133	2.65E-01	5.15E-01	0.741	3.26E-01	2.274	0.02295
r2	p5	142	2.10E-01	4.58E-01	0.857	3.12E-01	2.751	0.00595
r2	p6	141	3.18E-01	5.64E-01	-0.105	3.09E-01	-0.338	0.73517
r3	p1	142	2.05E-01	4.53E-01	-0.035	1.18E-01	-0.299	0.76514
r3	p2	139	6.19E-02	2.49E-01	1.779	6.02E-01	2.957	0.00311
r3	p3	156	2.07E-01	4.54E-01	1.078	4.68E-01	2.303	0.02130
r3	p4	133	1.63E-01	4.03E-01	0.237	3.32E-01	0.715	0.47492
r3	p5	142	1.41E-01	3.76E-01	0.641	3.13E-01	2.052	0.04017
r3	p6	141	2.12E-01	4.61E-01	-0.037	3.08E-01	-0.119	0.90519
r4	p1	107	5.48E-10	2.34E-05	-0.007	1.08E-01	-0.068	0.94599
r4	p2	104	1.06E-09	3.25E-05	1.145	5.06E-01	2.261	0.02376
r4	p3	133	9.14E-10	3.02E-05	0.154	3.82E-01	0.404	0.68635
r4	p4	98	7.09E-10	2.66E-05	0.260	3.08E-01	0.842	0.39986
r4	p5	107	5.18E-10	2.28E-05	0.278	2.92E-01	0.950	0.34227
r4	p6	106	8.89E-10	2.98E-05	-0.219	2.85E-01	-0.769	0.44162
r5	p1	107	5.09E-10	2.26E-05	0.060	1.10E-01	0.544	0.58620
r5	p2	104	1.37E-09	3.71E-05	1.361	5.35E-01	2.543	0.01100
r5	p3	133	5.60E-10	2.37E-05	0.547	4.13E-01	1.322	0.18601
r5	p4	98	5.57E-10	2.36E-05	0.547	3.09E-01	1.770	0.07675
r5	p5	107	7.31E-10	2.70E-05	0.342	2.93E-01	1.165	0.24392
r5	p6	106	5.38E-10	2.32E-05	0.408	2.88E-01	1.420	0.15568
r6	p1	113	3.03E-01	5.50E-01	-0.106	2.06E-01	-0.514	0.60749
r6	p2	113	3.33E-01	5.77E-01	0.006	9.01E-01	0.007	0.99446
r6	p3	171	1.16E+00	1.08E+00	0.403	6.54E-01	0.616	0.53821
r6	p4	113	3.28E-01	5.73E-01	0.642	6.70E-01	0.958	0.33793
r6	p5	113	3.21E-01	5.66E-01	-18.357	1.13E+04	-0.002	0.99871
r6	p6	113	2.76E-01	5.26E-01	0.833	6.13E-01	1.623	0.10456

r7	p1	06	1.51E-01	3.88E-01	-0.019	1.11E-01	-0.171	0.86459
r7	p2	03	8.03E-02	2.83E-01	1.572	5.56E-01	2.827	0.00470
r7	p3	32	9.50E-02	3.08E-01	1.060	4.08E-01	2.596	0.00944
r7	p4	97	1.39E-01	3.73E-01	0.400	3.18E-01	1.258	0.20843
r7	p5	06	1.20E-01	3.46E-01	0.324	3.11E-01	1.041	0.29797
r7	p6	05	1.68E-01	4.09E-01	-0.320	3.00E-01	-1.069	0.28513
r8	p1	34	8.28E-10	2.88E-05	-0.379	1.53E-01	-2.485	0.01296
r8	p2	32	5.21E-10	2.28E-05	0.709	5.15E-01	1.377	0.16854
r8	p3	33	5.47E-10	2.34E-05	-0.079	4.60E-01	-0.172	0.86370
r8	p4	26	6.66E-10	2.58E-05	-0.247	4.07E-01	-0.607	0.54371
r8	p5	34	5.68E-10	2.38E-05	0.022	3.84E-01	0.057	0.95433
r8	p6	34	1.18E-09	3.44E-05	-0.901	3.81E-01	-2.366	0.01797
r0	p1	45	3.54E-02	1.88E-01	-0.307	1.09E-01	-2.813	0.00491
r0	p2	42	6.25E-10	2.50E-05	1.596	4.24E-01	3.765	0.00017
r0	p3	58	7.50E-10	2.74E-05	0.531	3.46E-01	1.534	0.12511
r0	p4	36	3.71E-02	1.93E-01	0.230	2.98E-01	0.772	0.44027
r0	p5	45	1.59E-02	1.26E-01	0.460	2.98E-01	1.546	0.12215
r0	p6	44	4.06E-02	2.01E-01	-0.010	2.76E-01	-0.037	0.97081