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How can an agri-environmental scheme be designed for farmland bird protection, and what does it mean for the CAP 2023–2027?

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ABSTRACT

Biodiversity loss is recognized as a major global threat. The European Commission has addressed this issue with vigour in its current strategy papers. Farmland birds, such as the lapwing (*Vanellus vanellus*), whose population has been rapidly declining in Germany, have been particularly affected. To date, the European Union has tried to tackle the problem of biodiversity loss mainly with voluntary agri-environmental schemes (AESs), which are financed by the European Agricultural Fund for Rural Development (EAFRD). However, only a small fraction of agricultural land is enrolled in such programs. We identify the possible drivers and inhibitors of farmers' acceptance of a potential AES that, if introduced, could contribute to lapwing conservation. Our analysis is based on a discrete choice experiment conducted with 252 arable farmers in Germany. The results suggest that scheme attributes tied with EAFRD compliance, i.e., a minimum participation period of five years and the nature of the relevant sanctions regime, reduce farmers' potential acceptance of the proposed AES. Furthermore, farmers and farm characteristics have an influence on preferences for specific AES attributes. Finally, this article outlines how the identified weaknesses of AES may be addressed in the new "Green Architecture" of the Common Agricultural Policy 2023–2027.

1. Introduction

Biodiversity loss is recognized as a major global threat to the ecosphere and to human welfare. The Global Assessment Report on Biodiversity and Ecosystem Services states that natural ecosystems have declined by 47 % on average relative to their earliest estimated states and that approximately 25 % of species are threatened with extinction (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, 2019). In its Global Risk Report 2020, the World Economic Forum considers biodiversity loss to be the second most impactful and the third most likely risk in the next decade. Biodiversity loss poses a potential threat to humanity, as it may lead to disruption of entire supply chains or even the collapse of food and health systems (World Economic Forum, 2020).

The European Commission addresses this issue with vigour in its current strategy papers, such as the Farm to Fork Strategy (European Commission, 2020a) and the European Green Deal (European Commission, 2019). The Biodiversity Strategy for 2030 states that "farmland birds (…) are key indicators of the health of agroecosystems" and that "their alarming decline must be reversed" (p. 7). The strategy proposes that at least 10 % of agricultural land be dedicated to high-diversity landscape features, such as rotational or non-rotational fallow land (European Commission, 2020b).

The European Union's (EU) Common Agricultural Policy (CAP) is a key policy instrument for preserving and improving biodiversity. However, as the European Court of Auditors (2020) recently criticized, the CAP falls short of achieving this goal. In fact, all available data indicate a decline in farmland biodiversity. This phenomenon is well documented in the EU, as farmland bird populations are reported to have declined by approximately 30 % since 1990 (German National Academy of Sciences Leopoldina, acatech, 2020). Among the different CAP instruments, agri-environmental schemes (AESs), financed by the European Agricultural Fund for Rural Development (EAFRD), are considered to have the greatest potential to enhance biodiversity (European Court of Auditors, 2020). However, the adoption of these voluntary programs is insufficient for having a substantial impact on the targeted populations. Only a small fraction of agricultural land is enrolled in AESs that tackle biodiversity issues, such as fallow and field

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strips (e.g. for Germany: Pabst, Achtermann, Langendorf, Horlitz, & Schramek, 2018; Röder et al., 2019).

We analyse potential drivers and inhibitors of acceptance of an AES directed at protecting the lapwing (*Vanellus vanellus*). The lapwing is a farmland bird that serves as an indicator for several endangered species that inhabit agricultural landscapes. Its population in Germany declined by about 80 % between 1990 and 2019 (Association of German Avifaunists, 2023), mainly because of a low breeding success that is attributed to several factors. Prominent among these factors is grassland management, which is often practised intensively (i.e., very dense swards that are mown too frequently) and thus reduces the survival rate of lapwing chicks (Roodbergen, van der Werf, & Hötker, 2012). Currently, a considerable share of the lapwing population in Germany breeds on arable land, mainly in fields with spring-sown crops. However, frequent cultivation practices during the nesting period lead to a high nest destruction risk (Kamp et al., 2015). One of the most effective measures to increase breeding success of these birds in arable fields is the provision of lapwing plots (Sheldon, Chaney, & Tyler, 2007). A lapwing plot consists of 0.5 to 2 ha that are ploughed before the breeding period to create an area of bare soil, or an open sward, in the early spring. Lapwing plots remain unmanaged during the breeding season from mid-March until the end of June. These plots provide food, space for breeding, and cover for the chicks to hide from predators. The actual protection measure (lapwing plot) is integrated into an administrative framework that, among others, is characterised by specific funding conditions, remuneration, and duration. Together, this protective measure and the administrative framework form the corresponding AES.

This study addresses German farmers' acceptance of the proposed lapwing plot AES according the following research questions: Which characteristics of the scheme, and to what extent, are most likely to galvanize the adoption of lapwing plots? What kind of remuneration do farmers expect for the adoption of different measures constituting the lapwing plot scheme? How do idiosyncratic farm and farmer characteristics influence the preferences of individual farmers?

One important contribution of this study is our approach to define attributes of discrete choice experiments (DCEs) and their corresponding levels. The underlying management alternatives were designed in collaboration with farmers during field trials and with consideration to the relevant conservation literature, such as designing lapwing plot alternatives that aim to improve the breeding success of these farmland birds. We further ensured that the proposed lapwing plot combinations comply with the applicable regulatory requirements should they actually be incorporated into an AES. In this regard, this study's DCE may serve as a guide to design an environmentally effective lapwing plot, which is a policy-informing feature that, according to Lastra-Bravo, Hubbard, Garrod, and Tolón-Becerra (2015), has been neglected in the applied choice analysis literature concerning AESs.

The literature review presented in Section 2 serves as a reference for formulating this study's research questions and for postulating the corresponding hypotheses. These hypotheses are tested by modelling the discrete choice data, the theoretical underpinnings of which are explained in Section 3.1. Section 3.2 presents the design of the underlying DCE and is followed by details regarding the survey in Section 3.3. Section 3.4 introduces the variables that entered the discrete choice model and how they were specified in the underlying utility functions. In Section 4, we present and interpret this study's results, which precede the discussion and concluding remarks offered in Sections 5 and 6, respectively.

2. Relevant DCE literature

To answer our research questions, we conducted a discrete choice experiment, which is an approach that is being increasingly applied in different fields of research-based policy advice (Czajkowski, Zagórska, Letki, Tryjanowski, & Wąs, 2019; Narjes & Lippert, 2016) and that has been demonstrated to be useful for predicting the adoption of AESs (Hanley & Czajkowski, 2019). In this regard, Wynn, Crabtree, and Potts (2001) and Vanslembrouck, Huylenbroeck, and Verbeke (2002) emphasized that beyond payment amounts, the extent to which characteristics of the pursued measures would fit each farm's production context are important acceptance determinants. Moreover, many studies have suggested that flexibility in scheme structure increases the relative utility underlying farmers' adoption decisions. Herein, flexibility refers to the customizability of a scheme's features, such as the area to be included in the plan (Espinosa-Goded, Barreiro-Hurlé, & Ruto, 2010). Flexibility may also involve the possibility to cancel (Broch & Vedel, 2012), to determine the length of a scheme's contract (Ruto & Garrod, 2009), or to suspend the contract for one year (Lapierre, Le Velly, Bougherara, Préget, & Sauquet, 2023). Other important acceptance determinants are technical advice and assistance by extension services, which Lastra-Bravo et al. (2015) and Schaub et al. (2023) identify in their *meta*-analyses of drivers of participation in AESs. Lastra-Bravo et al. (2015) also identify information relevant to the scheme as a factor beneficial to AES participation. But in most of the literature that has been analysed in the more recent *meta*-analysis by Schaub et al. (2023) additional information about the scheme had no positive effect or even reduced likelihood of participation. Furthermore, in their choice experiments, some authors have included a scheme's regulatory aspects, such as monitoring (Broch & Vedel, 2012) and a pecuniary penalty for contract infringements (Alló, Loureiro, & Iglesias, 2015), both of which, as expected, were reported to decrease farmers' relative utility.

Several studies have identified farmers' idiosyncratic characteristics that increase the probability of their participation in AESs. A *meta*-analysis by Lastra-Bravo et al. (2015), for instance, found that part-time farmers were more willing to adopt EU agri-environmental schemes, while other publications (Breustedt, Schulz, & Latacz-Lohmann, 2013; Ruto & Garrod, 2009) report a similar disposition for farmers who have a positive attitude towards the environment. Schaub et al. (2023) however find this effect almost exclusively with regard to environmental attitudes towards agriculture and agricultural practices, and not with regard to attitudes towards the environment in general. Moreover, previous experience with environmentally friendly farming practices and effective agri-environmental programs has been reported to increase the probability of recurring participation among farmers (Breustedt et al., 2013; Lastra-Bravo et al., 2015; Latacz-Lohmann & Breustedt, 2019; Vanslembrouck et al., 2002), although Christensen et al. (2011) did not corroborate these findings. They did not find a systemic relationship between the probability to participate in the AES investigated in their study and farmers' previous participation in AESs.

Farm characteristics are important predictors regarding AESs. For instance, extensively-managed holdings and those comprising remote, poorly tailored, and low-yielding land are more likely to be enrolled in such schemes (Breustedt et al., 2013; Brown et al., 2019; Defrancesco, Gatto, Runge, & Trestini, 2008; Latacz-Lohmann & Breustedt, 2019). Managers of intensive farms, on the other hand, expect higher payments because of their higher opportunity costs for land (Breustedt et al., 2013; Latacz-Lohmann & Breustedt, 2019). With regard to farm size, Lastra-Bravo et al. (2015) concluded that it is generally easier to adopt agri-environmental measures on larger farms than on smaller farms. This finding is corroborated by Ruto and Garrod (2009), Alló et al. (2015) and Defrancesco, Gatto, and Mozzato (2018), although a few other studies show different results: in Capitanio, Adinolfi, and Malorgio (2011), managers of small farms are more interested in AES participation than managers of large farms; in Vanslembrouck et al. (2002), two different AESs are analysed and results show a positive relation between participation and small farms for one measure and a positive relationship between participation and large farms for the other measure. In this regard, Schaub et al. (2023) point out in their review that different studies show mixed results. They conclude that the relation between AES participation and farm size needs context-dependent interpretation.

3. Methodology

3.1. Discrete choice modelling

According to random utility theory (Marschak, 1960; Thurstone, 1927), the utility U_{nj} that a person (farmer) n draws from any alternative j can be divided into a deterministic (explainable) component V_{nj} and a random component ε_{nj} that is unknown to the researcher, described as follows:

$$U_{nj} = V_{nj}(X_j) + \varepsilon_{nj} = \beta' x_j + \varepsilon_{nj} \quad (1)$$

V_{nj} consists of a vector of X_j attributes (e.g., a farmer's hypothetical remuneration) that describe any choice alternative j and are weighted by parameters β (i.e., part-worth utilities) to account for their marginal (unit) contribution to farmer n's utility. Furthermore, random utility theory maintains that farmer n maximizes her utility by choosing, from a set of J choices, alternative i that she expects will yield her the greatest utility. The probability of this choice is described as

$$P_{ni} = P[(U_{ni} > U_{nj})\forall j \neq i] = P[(V_{ni} - V_{nj}) > (\varepsilon_{nj} - \varepsilon_{ni})] \quad (2)$$

Under the assumption that the error terms ε_{nj} are independent and identically distributed (IID) and follow an extreme-value I distribution, P_{ni} can be expressed as the standard (conditional) logit model. Discrete choice modelling aims to estimate the part-worths β by means of the maximum likelihood approach (Train, 2009).

Conditional logit (CL) models come along with the assumption of an identical taste across the sampled population. Relaxing this assumption, i.e., allowing for taste variation through the specification of random part-worths β_i, results in the random parameter logit (RPL) model (Eq. (3)), an extension of the standard logit.

$$P_{ni} = \int \frac{e^{\beta' X_i}}{\sum_{j=1}^{J} e^{\beta' X_j}} \phi(\beta|\theta) d\beta \quad (3)$$

The unconditional choice probability P_{ni} is the expected value of the standard logit probability over all the possible values of β_i, weighted by a continuous mixing distribution $\phi(\beta|\theta)$ is assumed to be normal with moments θ in this study. The random part-worths and constant enter the model as

$$\beta_i = \beta + \delta' w_i + \sigma v_i,\ v_i \sim N(0,1) \quad (4)$$

where σ is the standard deviation of β_i around the homogeneous population mean β, w_i are observed idiosyncratic characteristics that induce heterogeneity around the mean, and v_i is the (unobserved) individual-specific taste heterogeneity. These attributes, for which heterogeneous taste cannot be explained, are specified with a vector δ that is set to zero. Furthermore, the restrictive IID assumption is partially relaxed by allowing the stochastic utility elements that enter the model through β_i to correlate across alternatives and choice situations (Hensher & Greene, 2003; Hensher, Rose, & Greene, 2005).

The integral (Eq. (3)) does not have an analytically tractable solution and therefore must be approximated through computational simulation. For different θ, a simulated probability $\check{P}_{in}$ is obtained as the weighted mean of probabilities that are repeatedly calculated with random draws of β's mean and variance–covariance. This simulation is performed iteratively until the parameters θ that maximize the simulated log-likelihood function are found.

Once the parameters are estimated, one may calculate willingness to accept (WTA) distributions as the negative ratio of the partworth normal distribution moments (i.e., mean and standard deviation) of any attribute of interest to the partworth of the compensation payment. For this calculation the compensation coefficient needs to be fixed, i.e., its standard deviation is set to zero. The WTA estimates can be interpreted as the distribution of the remuneration that farmers expect for a discrete change in the adoption of any one measure that constitutes the lapwing-conservation scheme.

3.2. Experimental design

Actual lapwing conservation measures were designed based on literature research, field trials, and group discussions with farmers. Following Whittingham (2011) and Perkins, Maggs, Watson, and Wilson (2011), who emphasized the importance of adaptive management and testing the effectiveness of AESs, we carried out field trials across five breeding seasons from 2015 to 2017 as well as 2019 and 2021. During this process, we maintained continuous communication with the farmers participating in the field trials to capture their views and concerns. In the field tests, we modified the lapwing plots a few times to achieve the highest possible breeding success and to improve their applicability by farmers. We attained the highest breeding success of 0.9 fledglings per pair, when we created compact plots in spring crop fields. Other variants resulted in lower breeding success: lapwing plots as stripes along spring crops: 0.3; compact plots in winter crop fields: 0.5 (Cimiotti et al., 2022). In addition, the design had to comply with certain regulatory and administrative standards so that the measure can be implemented in an AES.

We developed different design variations that were designed based on discussions with the farmers who participated in the field trials. The discussions took place in September 2017 with two farmers in Braunschweig (i.e., in a region predominantly cultivated with sugar beet and silage maize) and with four farmers who predominantly cultivate silage maize in Münsterland. The aim of these discussions was to determine the extent to which a measure's characteristics were acceptable to farmers. Items leading to diverging opinions were incorporated into the standardized questionnaire that was administered along with the discrete choice experiment.

Based on the actual conservation measures discussed above, we defined six DCE attributes and their design levels to constitute hypothetical yet realistic lapwing-conservation scheme alternatives (Table 1: Columns 2 and 3). Column 4 encompasses one of twenty choice cards that differed in the attribute level combinations of the three choice alternatives they contained (i.e., options A and B, and opt out), from which farmers were asked to choose only one on each choice occasion.

The first attribute describes the farmer either seeding the lapwing plot with a grass-clover mixture (until March 15) or creating bare soil conditions by, for example, harrowing (until March 15). Seeding establishes an open sward that creates cover for the chicks to hide from predators (mainly raptors). We attempted to closely mimic the breeding habitat that lapwings prefer in the farmed landscape, which consists of low-intensity grassland (Shrubb, 2009). Furthermore, the grass-clover mixture shall limit the establishment of weeds. However, farmers may fear that the grass-clover mixture actually leads to weeds on the lapwing plot, which could spread to other parts of their field.

The second attribute describes the lapwing plot's position in the arable field. During the discussions, most farmers stated a preference for the plot being located at the field margin, an arrangement that would be easier to manage with machinery. However, positioning the lapwing plot within the field is advantageous for the breeding success of lapwings because fewer disturbances can be expected (e.g., from dogs on farm tracks). Sheldon et al. (2007) identified distance from the lapwing plot to the boundaries of the field as one of the best explanatory variables for chick survival rates.

Lapwings also breed on the field surrounding the designated lapwing plots, so marking these nests is an additional measure to increase breeding success. The third attribute concerns the option of marking lapwing nests that have been placed outside of lapwing plots (i.e., on the cultivated part of the arable field) so that farmers can drive around them when carrying out agricultural practices. Plard et al. (2019) suggested that this form of nest protection has a positive effect on lapwing reproductive rates. Although this measure falls under the responsibility of local ornithologists, from the farmers' point of view, driving around

Table 1
Attributes, attribute levels and one example of a choice card.

Nr	Attribute	Attribute levels	Example of a choice card		
			Option A	Option B	Opt out
1	Seeding with a grass-clover mixture	- Bare soil, no seeding: soil cultivation until March 15 - Open sward: seeding with a grass clover mixture until March 15	Seeding	No seeding	No participation
2	Position of the lapwing plot	- At the field margin - Within the field	At the field margin	Within the field	
3	Obligatory marking of nests on cultivated part of the field	- Marking of lapwings' nests - No marking	No	No	
4	AES participation period	- One year - Five years	Five years	One year	
5	Level of sanctions in case of an infringement to AES rules[a]	- Low: 7 % of remuneration - High: 7 % of remuneration plus 3 % of the farm's direct payments	High	Low	
6	Remuneration	700/ 1000/ 1300/ 1600 €/ha	1300 €/ha	700 €/ha	

[a] The AES rules that were mentioned in the survey refer to the corresponding documentation and management requirements.

nest markings implies additional effort.

Attributes 4 and 5 (i.e., AES participation period and sanction severity) are decisive in the EU to qualify for co-financing through the European Agricultural Fund for Rural Development (EAFRD). Both a minimum participation period of five years (European Parliament and Council, 2013, Article 28 (5)) and high sanction severity (European Commission, 2014: Articles 15ff.)[1] described as high in Table 1 are compliance criteria for EAFRD participation in the CAP funding period 2014–2020. This means that an AES with a participation period of one year and low sanction severity is noncompliant with EAFRD rules and thus cannot be co-financed by European funds, so it must be fully financed by the respective region or member state.

Attribute 6 implies the potential remuneration levels that we derived from the gross margin calculations for different crops. Farmers would be compensated for yield losses and other costs incurred when implementing the lapwing plot AES. Some of the levels were tested during field trials in cooperation with farmers. The lowest and highest levels represent the ex ante lower and upper bounds of a realistic compensation scheme range.

We used Ngene software (v. 1.2.1) to generate an orthogonal design for a DCE pilot with 19 farmers. The resulting data were fitted to a conditional logit model to obtain parameter estimates that served as priors for the generation of a D-efficient design (optimized for RPL) for the final survey (D-error: 0.08). A D-efficient design aims to obtain results that generate parameter estimates with minimal standard errors (ChoiceMetrics, 2014). The final design consisted of 20 choice cards that were divided into 2 blocks and then randomly assigned to each respondent; i.e., each respondent was presented with one of two series (i.e., blocks) of 10 choice cards. The sequence of choice cards was shuffled between respondents.

3.3. Survey

We conducted the survey from January to March 2018 via an online panel "agri EXPERTS" (https://www.agri-experts.de), which comprises 1,209 farmers of arable land, and the website "agrarheute.com". A total of 284 farmers cultivating spring crops participated in the survey. However, we evaluated only 252 questionnaires due to the following reasons: We discarded the answers of 14 respondents who spent less than 8 min completing the survey, as we considered this to be too short to ensure meaningful answers.[2] The answers of another 8 respondents, who did not answer all of the relevant questions on their socioeconomic characteristics, were also dropped. Another 10 questionnaires were completed by foreign respondents from German-speaking regions, so they were also discarded, as our research area covers only Germany. Of the remaining 252 respondents, 198 (79 %) came from the agri EXPERTS panel (i.e., a 16 % response rate), and the other 54 (21 %) came from the website.

The choice experiment was preceded by a general introduction to the lapwing plot, which was followed by a list of funding requirements based on the results of field trials, e.g., range of plot size and minimum distances to trees, hedges, and roads. Subsequently, the farmers were presented an explanation of the different attributes and attribute levels of the lapwing-conservation scheme. The farmers were afterwards presented with one of two blocks of 10 different choice cards, one of which is shown in Table 1 as an example. The next section of the questionnaire consisted of questions regarding the respondents' attitudes towards the protection of rare animal species and, for example their experience with protection measures similar to the lapwing plot (i.e., experience with setting aside biodiversity reserves). Furthermore, we asked respondents to provide information on their farm (e.g., size) and socioeconomic characteristics (e.g., age).

3.4. Random parameter logit model specification

We used NLOGIT 6 econometric software to analyse the 2,520 discrete choice observations from 252 respondents who each answered 10 choice sets. While the remuneration attribute entered the utility model as a numeric variable, the remaining (categorical) attributes describing the lapwing plot scheme were effects coded to avoid confounding their base levels with that of the alternative specific constant (i.e., common for alternatives A and B), which indicates utility in

[1] To reduce the cognitive burden of the interviewees, the sanction severity levels presented in the survey are a strong simplification of the actual sanctioning scheme. We constructed the sanction levels prior to the interviews in a stylized way so that penalty levels reflect typical situations for an average-sized German farm. The high sanction level depicts the case of an EAFRD rule infringement. The low sanction level corresponds to typical penalties of AES outside the EAFRD (e.g., AES contracts financed by a foundation or regional government only).

[2] The distribution of response time among respondents shows a sharp frequency increase past the 8-minute mark, so that we assume a meaningful survey duration from this measurement on.

relation to the base reference of opting out the conservation scheme (Hensher, Rose, & Greene, 2015). All attributes were assigned generic coefficients.

The DCE data were fitted to a random parameter logit (RPL) model that accounts for the panel structure and assumes a normal distribution for all part-worths, except for that of the "remuneration" attribute, which was fixed to obtain WTA estimates.

Taste heterogeneity was partly explained with idiosyncratic covariates that entered the random part-worth (and constant) specification (cf. Equation (4)) through w_i, mostly as effects-coded categorical variables.

4. Results

4.1. Descriptive statistics

In Table 2, we compare our sample with Germany's population of farmers who cultivate spring crops in terms of characteristics that are relevant to the establishment of lapwing plots, such as arable land area. However, the agricultural structure in Germany differs considerably by region, so farms cannot be directly compared. For this reason, we divided our sample[3] and the total population into regional subgroups (Federal Statistical Office and Statistical Offices of the Länder, 2016; Thünen Atlas, 2010).

Column 4 describes 116 respondents from the German federal states of Schleswig-Holstein, Lower Saxony, and North Rhine-Westphalia, which are fairly comparable in their agricultural structure and thus constitute the group representing the "North" region. We compared this group with a sample from the Farm Structure Survey (FSS), which represents the population of farmers from these northern federal states that cultivate spring crops (cf. Table 2, Column 5) (Research Data Center of the Federal Statistical Office and Statistical Offices of the Länder, 2016). Similarly, 88 respondents from the federal states of Baden-Württemberg and Bavaria were grouped to represent the "South" region (cf. Table 2, Column 7), and this region was then compared with its 2016 FSS counterpart (Column 8). Of the remaining 48 respondents, three did not disclose their postal codes. The remaining respondents belong to different federal states but their number was insufficient for a meaningful comparison with the total population of their corresponding federal states. Thus, this group was excluded from the descriptive statistics provided in Table 2.

Farms from the northern region were overrepresented in our sample by a 13-percentage point difference to their 33 % share of the total population. Farms from the South are, on the other hand, underrepresented by 15 percentage points.

For variables with metrically scaled distributions, we compared the percentiles of our sample with those of the FSS population and we performed the (one-sided) one-sample Wilcoxon test for equality of medians. We did not use the one sample *t*-test, because for the FSS population we only know the percentiles (not the mean) and some of our sample data are not normally distributed. For "Share of arable land per farm" and "Livestock units per ha", we also did not apply the Wilcoxon test because the values in our sample are not symmetrically distributed around the median. We used the (one-sided) binomial test for the comparison of frequency distributions for dichotomous variables (shares of farms with cattle etc.).

Regarding land distribution, the sampled farms are larger than the ones they are supposed to represent in the total population of farms from the northern and southern regions. In the former, the quartiles are roughly twice as large as those in their respective population in the FSS, while in the latter, the quartile differences are less pronounced. Similarly, the amount of arable land per sampled farm in both regions is roughly twice that of the respective counterparts in the FSS population at every quartile. The differences in the share of arable land, however, are smaller. Looking at the median (50th percentile) stocking densities reveals that roughly half of our sampled farms in both regions did not keep livestock at a relevant extent. This finding deviates considerably from the underlying regional populations which have a median stocking rate per farm of 1.05 in the North and 0.54 in the South. In addition, in the third quartile of our sample, the livestock density was much lower than that in the respective FSS populations. In contrast, 5 % of the sampled farms with the largest livestock density have more livestock units per hectare than their 95th percentile counterparts in the FSS populations of both the North and the South. Additionally, the share of farms with cattle (approximately 30 %) is much lower in our sample than that of the FSS population (approximately 50 %).

The shares of farms cultivating spring crops (i.e., spring barley, oats, maize and potatoes) in our sample are fairly comparable with that of the FSS population. However, the binomial tests indicate that there are some differences in particular for silage maize (lower in the sample) and sugar beet (higher in the sample). Farm operating managers are slightly younger in our sample than in their FSS counterparts.

4.2. Choice modelling

Table 3 presents the model results for a random parameter logit that was specified with a homogeneous (i.e., with standard deviation set to zero) "remuneration" coefficient and with preference-heterogeneity explaining interaction terms. The underlying hypotheses are listed and explained in the Annex.

The marked negative random coefficient mean estimates for "Bare soil" and "5-year AES participation period" indicate that ceteris paribus farmers would, on average, prefer seeding with a grass clover mixture until mid-March (i.e., establishing open swards) and a one-year AES participation period over leaving bare soil conditions and a five-year AES participation period. On the other hand, the marked positive random coefficient mean estimates suggest that farmers prefer low sanctions and lapwing plots to be established at the edge of their fields with no nest markings. Furthermore, the negative random constant mean indicates that, regardless of the attributes of a lapwing conservation AES, respondents prefer not to participate in any such scheme.

Moreover, the marked standard deviation estimates of the random part-worths indicate that there is considerable preference heterogeneity among the respondents. The RPL was specified with covariates that interacted with the mean random part-worths (see Eq. (4)) to partly explain heterogeneity in preferences for single AES attributes. For instance, we tested the hypothesis that farmers who also keep cattle (versus those who do not keep cattle) have a higher preference for open swards, as those with cattle benefit from mowing the lapwing plot after the breeding season (i.e., after July 15) because they can use the cut grass as fodder. The results reported in Table 3 support this hypothesis.

The results in Table 3 also support the hypothesis that farm size has an influence on preferences for sanction severity levels specified for EAFRD non-compliance *vs*. compliance. Preference for low sanctions increases with farm size. Moreover, farmers with an affinity for the protection of rare animal species (when applying agricultural measures) perceived, on average, less negative utility for the prospect of participating in the lapwing plot AES than those with little or no such affinity or those who did not want to comment on this issue[4]. The same holds for farmers who manage operations with marginally productive arable land (i.e., partitioned into small plots, inaccessible and/or often waterlogged) in comparison to farmers managing no such land. The estimated coefficients also suggest that with increasing age and increasing farm size, farmers are less likely to participate in the AES. Moreover, we hypothesized that previous experience with setting aside biodiversity reserves (e.g., sowing and maintaining flowering strips for enhanced pollinator

[3] Based on the postal codes that were also surveyed with the questionnaire.

[4] The operationalization of this hypothesis is explained in the Annex.

Table 2
Descriptive statistics for the sample in comparison to the total population.

Variable	Percentile	Overall survey data	Survey data North	FSS North	p-value Wilcoxon test	Survey data South	FSS South	p-value Wilcoxon test
Number of farms		252	116	55,857		88	85,897	
Share of total farms (%)		100	46	33		35	50	
Farm size (ha)	25th	50	64	28	0.000	25	16	0.000
	50th	100	118	57		50	30	
	75th	176	175	99		110	57	
Arable land per farm (ha)	25th	28	48	17	0.000	18	9	0.000
	50th	76	95	39		35	19	
	75th	150	149	74		88	41	
Share of arable land per farm (%)	25th	63	79	58		60	52	
	50th	90	95	85		81	75	
	75th	99	100	98		97	94	
Livestock units per ha	5th	0	0	0		0	0	
	25th	0	0	0		0	0	
	50th	0.02	0.01	1.05		0	0.54	
	75th	0.94	1.13	1.95		1.01	1.36	
	95th	2.96	4.03	3.43		2.92	2.31	
Age of the farm's operating manager	5th	30	29	33	0.000	31	32	0.037
	25th	40	41	45		42	44	
	50th	50	49	52		50	51	
	75th	56	55	58		56	58	
	95th	63	62	65		63	65	
Share of farms with…		**Overall survey data**	**Survey data North**	**FSS North**	**p-value binomial test**	**Survey data South**	**FSS South**	**p-value binomial test**
Cattle (%)		34	32	52	0.000	33	49	0.002
Spring barley (%)		21	22	17	0.080	22	26	0.208
Oats (%)		16	13	10	0.182	17	19	0.380
Grain maize (%)		17	12	18	0.056	25	20	0.150
Silage maize (%)		55	62	70	0.041	49	63	0.005
Sugar beet (%)		37	50	19	0.000	23	13	0.008
Potatoes (%)		10	11	13	0.342	10	17	0.054

FSS = Farm Structure Survey of German arable farmers cultivating spring crops. FSS data of the age of the farm's operating manager does not relate to the total population but is based on an extrapolation of a sample. Source: Research Data Center of the Federal Statistical Office and Statistical Offices of the Länder (2016) and own calculations.

fauna diversity) or any voluntary AESs (e.g., not using pesticides, low stocking densities on pasture) positively influenced preference for participation in a lapwing conservation AES. The results, however, do not support these hypotheses, as the corresponding standard errors are high and the estimated coefficients are comparably small. The same holds for the hypothesis that weed pressure on arable land negatively influences preference to participate.

4.3. *Willingness to accept estimates*

We obtained willingness to accept (WTA) estimates by calculating the negative ratio of the attribute partworth distribution moments (i.e., mean and standard deviation) to the homogeneous compensation partworth estimated with the RPL model (Table 4). In the context of this study, WTA estimates refer to annual remunerations per ha.

The resulting WTA estimates suggest that if the proposed AES were offered to farmers on the condition that the soil on the lapwing plot must be left bare, then on average –ceteris paribus– they would expect a 125 € higher remuneration compared to for an AES offer that calls for open swards. For a 5-year participation period, the remuneration would have to be 515 € higher than that for a 1-year period for the farmers to maintain their utility levels. Dividing the constant by the homogeneous compensation partworth resulted in a mean WTA estimate of 846 € that reflects the expected remuneration of the farmers for their participation in any lapwing conservation scheme, regardless of the arrangement of its constituting attributes.

If the lapwing plot were established at the edge of the field, the farmers expected a compensation 166 € lower than if the lapwing plot were established within the field. The WTA for the additional marking of nests around the designated lapwing plots is 221 €. Similarly, relative to a high sanction regime, the WTA associated with a low sanction regime is on average 538 €/ha lower. The expected compensation decreases by 0.15 € with each additional hectare of farm size. Furthermore, farmers with cattle husbandry would expect 88 € more if the soil on the lapwing plot must be left bare (*vs.* open swards) in comparison to farmers without cattle husbandry.

Our results also indicate that, for the adoption of any lapwing plot AES arrangement, farmers with an affinity for the protection of rare animal species (when applying agricultural measures) demand 331 € less in remuneration compared to farmers with little or no such affinity, ceteris paribus. Farmers managing marginally productive arable land expect 627 € less than farmers without marginally productive arable land. Expectations for remuneration increase with age, at a rate of 12 € per year, and with farm size, at a rate of 0.36 € per ha. The remaining WTAs listed in Table 4 refer to hypotheses that were not supported by the results; thus any subsequent interpretations of WTAs would not be meaningful (Hensher et al., 2015, p. 464).

5. Discussion

Our results suggest that attribute levels associated with current EAFRD compliance demands strongly reduce farmers' acceptance of a

Table 3
Random parameter logit results with explained preference heterogeneity.

Variable	Coefficient mean	SE	p value	Standard deviation	SE of standard deviation	p value of standard deviation
Random parameters						
Bare soil *vs. open sward*	−0.189	0.076	0.013	0.783	0.082	0.000
Plot at the edge of the field *vs. within the field*	0.249	0.055	0.000	0.247	0.090	0.006
No marking of nests *vs. marking of nests*	0.332	0.060	0.000	0.530	0.079	0.000
5-year *vs. 1-year AES participation period*	−0.775	0.078	0.000	0.734	0.088	0.000
Low sanctions *vs. high sanctions*	0.810	0.085	0.000	0.798	0.090	0.000
Constant (**Option A or B** *vs. no participation at all*)	−2.548	0.658	0.000	2.930	0.225	0.000
Nonrandom parameter						
Annual remuneration (€/ha)	0.003	0.000	0.000	SD fixed at zero		
Interaction terms						
Attribute	**Covariate**	**Coefficient**	**Standard error**	**p value**		
Bare soil *vs. open sward*	Cattle husbandry	−0.133	0.069	0.055		
Low *vs. high sanctions*	Farm size (ha)	0.00046	0.00023	0.047		
Constant*Covariate						
Affinity towards protection of rare animal species (yes = 1)		0.498	0.143	0.000		
Experience with setting aside biodiversity reserves (yes = 1)		0.179	0.122	0.142		
Experience with any voluntary AES (yes = 1)		−0.091	0.123	0.457		
Moderate weed pressure *vs. high*		0.236	0.183	0.198		
Low weed pressure *vs. high*		−0.239	0.246	0.332		
Manages arable land with marginal agricultural productivity (yes = 1)		0.944	0.166	0.000		
Age		−0.036	0.012	0.002		
Farm size		−0.00109	0.00039	0.005		
Model diagnostics						
N (Observations)	2520					
K (Parameters)	38					
Likelihood ratio test: χ^2 with 36 degrees of freedom	1923					
LL at convergence	−1807					
LL at model restricted to only two constants	−2767					
AIC/N	1.464					
McFadden pseudo R^2	0.3469					

SE = Standard error, SD = Standard deviation.

lapwing plot AES. A minimum participation period of five years *vs.* one year and high *vs.* low sanction severity are associated with lower utility levels and, accordingly, with higher compensation expectations. Preference for short-term contracts is in line with Ruto and Garrod (2009), Gramig and Widmar (2018), Krah et al. (2018) and Horne (2006). Our results on sanctions also corroborate the hypothesis of a general disutility perceived for fines and monitoring observed by Broch and Vedel (2012) and by Alló et al. (2015). The fear of EAFRD sanctions, even those based on unintentional and minor violations, is also documented in the EAFRD evaluation literature (Pabst et al., 2018). In this respect, the higher disutility perceived by farmers with larger farms could be explained by the potentially higher pecuniary penalty they could incur, as the penalty's magnitude depends on farm size. However, one should be careful with the interpretation of our estimate for the sanctioning scheme part-worth. The sanction levels presented to the interviewees during the survey are based on the average farm size in the population, which is markedly smaller than that in our sample. Due to the characteristics of the current EAFRD sanction scheme, the presented sanctions are therefore somewhat higher for most interviewed farms than in practice. This effect increases with farm size.

Depending on the overall presence of open and/or waterlogged areas during the spring, lapwings may, from one year to the other, shift their breeding territory within a certain radius, which may reconcile with farmers' preference for the shorter AES participation period of one year. One must nevertheless be careful with this interpretation, as our preference estimates are relative to their corresponding design references. For the particular "participation period" attribute, this would mean that farmers may, on average, still expect monetary compensation for committing to a 1-year participation period, although 515 €/ha less than for a 5-year commitment. Other attributes of lapwing plot AES involve an absolute trade-off between environmental and economic goals, which is reflected in farmers' preferences regarding willingness to adopt these measures with some degree of remuneration. For example, marking nests that have been placed outside of the lapwing plots increases the breeding success of these birds, yet farmers expect an annual 221 €/ha in remuneration for this measure to be included in the lapwing plot AES. On the other hand, among those farmers who participated in the field trials that informed the selection of DCE attributes, some expressed being satisfied with a compensation payment of 50 € for the trouble of having to drive around the nest markings, while others did not expect any compensation at all. Notwithstanding the response bias that these direct WTAs may exhibit (e.g., as motivated by courtesy towards the interviewer), they correspond with the wide range of values covered by the estimated standard deviation of the nest markings attribute, which spans both positive and negative WTA values.

From the discussions with the farmers who participated in the abovementioned field trials, one could hypothesize that some barriers to the adoption of lapwing plots may be removed by complementing an AES with advice and/or education campaigns, such as those delivered by local environmental managers. Such managers could guide farmers with ornithological knowledge in the selection of suitable areas of land during the implementation of the lapwing plot AES and could mediate communication with managing bodies such as those administering the EAFRD program. In this regard, Hötker and Jeromin (2019) suggested that lapwing populations in Germany are more likely to develop in areas designated for the protection of meadow birds if the equivalent of at

Table 4
Willingness to accept (WTA).

Variable	WTA mean (€/ha/year)	SE	WTA standard deviation (€/ha/year)	SE of standard deviation
Random parameters				
Bare soil *vs. open sward*	125	50	520	63
Plot at the edge of the field *vs. in the field*	−166	36	164	61
No marking of nests *vs. marking of nests*	−221	40	352	57
5-year *vs. 1-year AES participation period*	515	54	488	66
Low sanctions *vs. high sanctions*	−538	60	530	68
Constant (**Option A or B** *vs. no participation at all*)	846	205	973	96
Interaction terms				
Attribute	**Covariate**	**WTA (€/ha/year)**	**SE**	
Bare soil *vs. open sward*	Cattle husbandry	88	46	
Low *vs. high sanctions*	Farm size (ha)	−0.15	0.08	
Constant*Covariate				
Affinity towards protection of rare animal species (yes = 1)		−331	96	
Experience with setting aside biodiversity reserves (yes = 1)		−119	82	
Experience with voluntary measures (yes = 1)		61	81	
Moderate weed pressure *vs. high*		−157	122	
Low weed pressure *vs. high*		159	164	
Manages arable land with marginal agricultural productivity (yes = 1)		−627	112	
Age		12	4	
Farm size		0.36	0.13	

SE = Standard error.

least one full-time employee is hired per 10,000 ha of managed area. Moreover, other authors concluded that expert support reduces the reluctance of farmers to participate in AESs and their proneness to infringe on AES rules and increases the effectiveness of the environmental measures in question (Blazy et al., 2021; Lastra-Bravo et al., 2015; Perkins et al., 2011; Schoof et al., 2019; Whittingham, 2011).

Local environmental managers could also focus their efforts on mobilizing and supporting farmers who manage operations on marginally productive arable land (i.e., partitioned into small plots, inaccessible and/or often waterlogged). According to Brown et al. (2019), Latacz-Lohmann and Breustedt (2019), Breustedt et al. (2013) and Defrancesco et al. (2008), farmers operating marginally productive arable lands are likelier to participate in an AES. Alternatively, as suggested by the findings of this study, farmers with marginally productive land expect lower annual payments, on average, for their participation in a lapwing plot AES per hectare than farmers without marginally productive land. The results of this study also suggest that farmers with an affinity for the protection of rare animal species (when applying agricultural measures) demand lower compensation payments for their participation in a lapwing plot AES than farmers with little or no such affinity, which corroborates similar findings from other studies on farmers' attitudes towards the environment and environmental protection (Breustedt et al., 2013; Lastra-Bravo et al., 2015; Latacz-Lohmann & Breustedt, 2019; Ruto & Garrod, 2009; Schaub et al., 2023). In addition, our findings suggest that the younger a farmer and the smaller the farm size, the lower is the demanded compensation. The latter effect is in line with Capitanio et al. (2011). However, it contradicts the results in Lastra-Bravo et al. (2015), Ruto and Garrod (2009), and Alló et al. (2015), where large farm size is associated with lower compensation demands. However, as Schaub et al. (2023) conclude, the effect of farm size should be interpreted context-specific and may in our case be influenced by the misspecification of high sanction levels. It should thus be interpreted with care.

Overall, our results suggest that attribute levels associated with EAFRD compliance could be an important barrier to the adoption of lapwing plot AESs. Comparing two otherwise identical AESs, the first with an annual commitment and low sanctions and the second with a five-year commitment and high sanctions, farmers would require an additional payment in the magnitude of 1000–1100 €/ha to participate in the second AES. Both components associated with EAFRD compliance raise the expected payment levels by roughly the same amount. These additional payment demands associated with EAFRD compliance for the farms in our sample reflect the magnitude of the opportunity costs of the replaced crops.[5] This calculation suggests that current procedures of calculating opportunity costs, which basically compensate for business-as-usual income losses only, do not sufficiently meet the farmers' payment demands associated with EAFRD compliance and thus are unlikely to attract widespread participation in a lapwing plot AES. This is concerning in view of population models that hint that at least 60 % of the German lapwing population needs to be safeguarded by lapwing plots or comparably effective measures on grassland to ensure population stabilization (Buschmann, Böhner, & Röder, 2023).

We cannot attest that our sample is representative of all German farmers growing spring crops. The comparison between the farming population and our sample shows some differences, such as a lower share of farms with cattle in the sample (section 4.1). Nevertheless, we think that conclusions can be drawn from our results for the design of the CAP 2023–2027. In our opinion the new "Green Architecture" of the Strategic Plan regulation (SPR) (European Parliament and Council, 2021a) offers three levers to achieve a greater implementation of environmentally-friendly farming practices and thereby improve prospects for the conservation of lapwings. The first lever is modifications to the administrative framework for AESs. For example, the maximum support rates for AESs defined in Annex II of EU regulation 1305/2013 (European Parliament and Council, 2013) are waived, so AESs with higher payments, reflecting the opportunity costs in regions with intensive agriculture, can be co-funded with EU funds more easily. In addition, SPR Art. 70 (4) clarifies that payment levels need not be based on average opportunity and transaction costs but should take into account the area target set by the member state to achieve the environmental objective. As stated above, support rates that are calculated based on average gross margins are too low for meaningful scaling of a lapwing plot AES, especially when taking into consideration that the breeding range of lapwings often covers areas with intensive agriculture. Last, AESs can in case of duly justified reason have a duration as short as one year (SPR Art. 70(6)).

Second, in Art. 31 with Eco-Scheme, the SPR defines a new instrument to address environmental and animal welfare objectives under the first pillar. Regarding the type of intervention, Eco-Schemes will be fairly similar to AESs in the second pillar of the CAP (Guyomard & Bureau, 2020). In contrast to AESs in many member states, Eco-Schemes will be only an annual obligation for farmers, and they will be able to modify the extent and location of their AES participation until mid-May. These features appeal to farmers' preference for short-term contracts. In addition, farmers are familiar with the support system of the first pillar, so given a comparable content of the measures it can be expected that the barriers to participating in Eco-Schemes will likely be lower in relation to a comparable AES in the second pillar.

[5] For the cultivated land considered in our field studies, we calculated gross margins ranging between 950 and 1300 €/ha/year, depending on the crop adjacent to the lapwing plot (i.e., mainly silage maize and sugar beet).

Third, the member states must redefine the control and sanctioning system of AESs in EAFRD. We regard this as an opportunity to redesign the current system with sanction severities that are less dissuasive for AES participation (European Parliament and Council, 2021b) in comparison to the current sanctioning system, which is one of the greatest barriers to acceptance.

6. Conclusion

Higher participation rates in EAFRD agri-environmental schemes are needed to achieve the EU Commission's biodiversity targets, especially since these schemes are considered to have the greatest potential to improve biodiversity. In this context, we identified the barriers to the adoption of a potential AES designed to protect lapwings. The current EAFRD rules concerning commitment duration and the severity with which infringements are sanctioned are important obstacles limiting the uptake of respective schemes. The framework for the CAP 2023–2027 offers several entry options to lower these barriers and therefore increases the environmental effectiveness of the CAP. Some of these options even allow increasing the efficiency because, ceteris paribus, lower payment levels compared to the current period would suffice to implement a measure on a given physical area. We also identified farm and farmer characteristics that influence farmers' preferences with regard to participating in a lapwing plot AES. Furthermore, we recommend the deployment of regional environmental managers to make use of information on farmers' preferences to mobilise and support them in participating in an AES.

On a different note, we consider that this study provides an example for the planning and ex ante assessment of stakeholder preferences for a potential but concrete AES.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

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Annex.

Model hypotheses

Nr.	Hypothesis	Explanation
1	*Farmers prefer open sward over bare soil on the lapwing plot.*	In the group discussions, some farmers expressed their preference for open sward because it may limit the establishment of weeds on the lapwing plot.
2	*Farmers prefer the lapwing plot to be at the field margin rather than within the field.*	In the group discussions, some farmers expressed their preference for the plots to be at the field margins because they are easier to manage with machinery.
3	*Farmers prefer not to have marked nests on the cultivated part of the field if they have to drive around them when carrying out agricultural practices.*	In the group discussions, farmers said that they do not mind the markings. However, we still hypothesized that most farmers do not prefer to have them on their fields because driving around nest markings requires additional effort.
4	*Farmers prefer the AES participation period to be one year instead of five years.*	In the group discussions, some farmers expressed their preference for a one-year participation period because of the greater flexibility.
5	*Farmers prefer low sanction severity instead of high sanction severity in the case of infringement of AES rules.*	In the group discussions, some farmers expressed their preference for low sanction severity. They consider the pecuniary penalty for the high sanction severity to be too high, especially because unintentional mistakes are easily made.
6	*Farmers with cattle have a greater preference for open sward vs. bare soil than farmers without cattle.*	In the group discussions, farmers with cattle expressed their preference for open sward because they may mow the plot after the breeding season and use the cut grass as fodder.
7	*The larger the farm is, the stronger the farmers' preference is for low sanction severity vs. high sanction severity in the case of infringement of AES rules.*	High sanction severity implies greater pecuniary penalties on large farms since the magnitude of the penalty depends on farm size.
8	*Farmers with an affinity towards protection of rare animal species (when applying agricultural measures) have a greater preference for participating in a lapwing AES than farmers with little or no such affinity or nonrespondents.*	Hypothesis derived from the literature, Lastra-Bravo et al. (2015). Farmers with a "positive attitude towards the environment" and "environmental awareness positively influences farmers' participation decisions".
	Operationalization of Hypothesis 8: In the questionnaire, we asked farmers to rate the following statement: "The protection of rare animal species plays an important role in the management of my land". We coded the answers "true" and "mostly true" as affinity for the protection of rare animal species. We coded the answers "mostly not true", "not true", and "not specified" as farmers having little or no affinity for the protection of rare animal species or as being nonrespondents.	

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Nr.	Hypothesis	Explanation
9	*Farmers who have experience with setting aside biodiversity reserves have a greater preference for participating in a lapwing AES than farmers without such experience or nonrespondents.*	Hypothesis derived from the literature, Lastra-Bravo et al. (2015). "Farmers' experiences with past AESs and other environmentally friendly farming practices has been shown in several studies to have significant effects on farmers' willingness to adopt a new AES".
10	*Farmers who have experience with any voluntary AES have a greater preference for participating in a lapwing AES than farmers without such experience or nonrespondents.*	We differentiated between experience with an AES that is comparable with the lapwing plot (Hypothesis 9) and experience with any voluntary AES (Hypothesis 10) to test for differences in the results.
11	*Farmers under moderate or low weed pressure on their arable land have a greater preference for participating in a lapwing AES than farmers under high weed pressure.*	Farmers facing moderate or low weed pressure on their arable land are less concerned about the establishment of weeds due to the lapwing plot than farmers facing high weed pressure.
	Operationalization of Hypothesis 11: In the questionnaire, we asked farmers to rate the following statement: "The weed pressure on my arable land is mostly:" We coded the answers "high" and "rather high" as high. We coded "rather low" and "low" as low. The remaining answer option was "moderate".	
12	*Farmers with marginally productive arable land have a stronger preference for participating in a lapwing AES than farmers without such land.*	Adopting AESs can increase the economic value of marginally productive land compared to conventional use. Hypothesis derived from the literature: Brown et al. (2019), Latacz-Lohmann and Breustedt (2019), Breustedt et al. (2013), Defrancesco et al. (2008).
13	*The farmers' age has an influence on his or her preference for participating in a lapwing AES.*	Age can influence preferences in two ways. Younger farmers may show a greater openness towards the adoption of AES than older farmers. Older farmers, on the other hand, might have a higher preference for AES participation because they no longer want to make large investments (e.g., in machinery). Therefore, they generate their income more from AES participation than younger farmers.
14	*Farm size has an influence on the farmers' preference for participating in a lapwing AES.*	Hypothesis derived from the literature: Some studies have found that the probability of participating in an AES increases with increasing farm size (Alló et al., 2015; Ruto & Garrod, 2009), whereas other studies have found that the probability of participation decreases with increasing farm size (Capitanio et al., 2011; Vanslembrouck et al., 2002).

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