FARMERS' PREFERENCES FOR AGRI-ENVIRONMENTAL SCHEMES: FINDINGS FROM A DISCRETE CHOICE EXPERIMENT FOR THE DESIGN OF A FARMLAND BIRD CONSERVATION MEASURE

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Abstract

Growing evidence suggests that biodiversity in the agricultural landscape is declining sharply. Farmland birds are particularly affected, the population of the lapwing (*Vanellus vanellus*) has been decreasing strongly in Germany. Up to now the European Union has tried to tackle the problem of biodiversity loss mainly with voluntary (second pillar) agri-environmental schemes financed by the European Agricultural Fund for Rural Development (EAFRD). However, only a small fraction of the agricultural land is enrolled in such programs. We analyze a potential scheme to protect the lapwing in order to identify drivers and inhibitors of acceptance. The analysis is based on a discrete choice experiment with 270 arable farmers in Germany. Results show that those scheme attributes associated with EAFRD compliance, the type of sanctioning and a minimum participation period of five years, particularly reduce the farmers' acceptance. Results for other attributes indicate that farmers' preferences and ecological requirements often contradict each other, so that they constitute an economic-ecological trade-off. Finally, the paper sketches how the identified weak spots of biodiversity protection schemes may be tackled under a different regime of Common Agricultural Policy (CAP). Here, we take up the current CAP reform proposals of the European Commission.

Key Words

Biodiversity protection, lapwing, agri-environmental schemes, discrete choice experiments

1. Introduction

Growing evidence suggests that biodiversity in the agricultural landscape is declining sharply. For farmland birds this is well documented as in the European Union they have declined by 30 % since 1990 (LEOPOLDINA, 2018; EBCC, 2017). Farmland bird abundance and diversity can be interpreted as a proxy for biodiversity on farming landscapes in general (SCHOLEFIELD ET AL., 2011). Up to now the European Union has tried to tackle this problem mainly with voluntary (second pillar) agri-environmental schemes financed by the European Agricultural Fund for Rural Development (EAFRD). However, farmers often do not take up these programs in a sufficient extent to achieve an impact on the targeted populations. Only a small fraction of the agricultural land is enrolled in agri-environmental schemes tackling biodiversity issues like fallow and field strips (Pabst et al., 2018; Röder et al., 2019).

We analyse a potential agri-environmental scheme to protect the lapwing in order to identify drivers and inhibitors of acceptance. The lapwing (*Vanellus vanellus*) is a farmland bird that stands exemplary for several endangered species of agriculturally used landscapes. The population has been decreasing sharply in Germany. Compared to 1990, the population in 2015 declined by three-forth (DDA, 2019). This is mainly because of a low breeding success, which is due to several factors especially a grassland management too intensive to allow the survival of the chicks (too dense swards mown too frequently) (ROODBERGEN et al., 2012). In Germany, nowadays over half of the population breeds on arable land, mainly on spring crops. However, the frequent cultivation measures during the nesting period lead to a high risk of nest destruction (Personal communication with HERMANN HÖTKER[1]). One of the most effective measures to increase breeding success on arable fields is a lapwing plot (SHELDON et

[1] Mr. HÖTKER is head of Michael-Otto-Institute of the German Nature and Biodiversity Conservation Union.

al., 2007). A lapwing plot is an area of 0.5 to 2-hectare, ploughed before the breeding period to create an area of bare soil or open sward in early spring. The lapwing plot remains unmanaged during the breeding season from Mid-March until the end of June. It provides food, space for breeding and creates cover for the chicks to hide from raptors.

With respect to acceptance of this measure we address the following research questions: Which characteristics of the support scheme influence the farmers' acceptance of the plots and to which extent? How high is the expected remuneration and how is it influenced by different characteristics of the scheme? How do different groups of farmers differ in terms of their potential participation in the scheme?

The analysis is based on a discrete choice experiment with 270 arable farmers in Germany. Several authors have undertaken discrete choice experiments to determine acceptance towards potential or existing agri-environmental schemes. The works refer to various contexts and different schemes, but nevertheless common patterns can be seen from the results. Early studies from WYNN et al. (2001) and VANSLEMBROUCK et al. (2002) emphasise that - besides levels of payments - characteristics of the required measure practices are of major importance for acceptance as they have to fit farm production contexts (WYNN et al., 2001). In many studies we observe that flexibility in scheme structure increases the farmers' utility. Flexibility means that there are as many options as possible for scheme properties, for example the size of the area to be included (ESPINOSA-GODED et al., 2010). Flexibility may also contain the possibility to cancel the contract (BROCH and VEDEL, 2012) or to have a short-term contract in comparison to a long-term contract (RUTO and GARROD, 2009). Further, some authors have included regulatory aspects in their choice experiments such as monitoring (BROCH and VEDEL, 2012) and a fine in case of infringement (ALLÓ et al., 2015) which both decrease farmers' utility.

The studies also identified farmers' characteristics indicating a greater probability to participate, such as farmers that are younger and better educated than the average (ALLÓ et al., 2015; RUTO and GARROD, 2009). Farmers with experience in agri-environmental schemes (VANSLEMBROUCK et al., 2002; BREUSTEDT et al., 2013), with a positive attitude to the environment (RUTO and GARROD, 2009; BREUSTEDT et al., 2013) or towards the effectiveness of agri-environmental programs (VANSLEMBROUCK et al., 2002) derive a greater utility from such programs. Farms' characteristics are also important. Farmers with extensively managed holdings and those with distant, poorly tailored and low-yielding areas are more likely to participate, because their opportunity costs are comparatively low. Managers of intensive farms on the other hand expect higher payments (BREUSTEDT et al., 2013). The role of farm size is more ambivalent. RUTO and GARROD (2009) and ALLÓ et al. (2015) determine that owners of large farms have a higher participation probability or value the payments more positively than the average. VANSLEMBROUCK et al. (2002) show that the connection may depend on the type of protection measure. In one measure of their study, the highest participation probability is linked to the largest farms; in another measure, however, to the smallest.

The results from the literature review serve as one reference point to derive the research design for our discrete choice experiment. However, above all, we developed the design and hypothesis from the specific context of the lapwing plot that we tested with farmers in field works. After an introduction into the methodology of discrete choice modelling in the next chapter (2.1), we will describe the research design in chapter 2.2, the survey and sampling in chapter 2.3 and model specification in chapter 2.4. Thereafter we will present (chapter 3) and discuss (chapter 4) the results and finish with concluding remarks.

2. Methodology

2.1 Discrete choice modelling

The methodological approach in designing and evaluating the survey is discrete choice experiments (DCE) (HENSHER et al., 2015; TRAIN, 2009). This means that farmers were presented successively with different combinations of protection measure attributes from which they could choose. From the responses, the independent influence of the different attributes on measure acceptance can be estimated. Systematic variation of measure attributes is - to our knowledge - only possible with discrete choice experiments. For example, with contingent valuation one can only vary remuneration expectations, but not other attributes (HANLEY et al., 2001).

In microeconomic theory, choosing for a certain alternative is associated with the utility that the decision maker, in our case a farmer, expects from the alternative. The theoretic basis for DCE is random utility theory which divides utility *U* of an alternative *j* and a person *n* (farmer) into a deterministic component *V* and a random component ε.

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

The deterministic component *V* consists of a vector of attributes *x* that describe the alternative, for example the remuneration that the farmer receives. The aim is to estimate the parameters β of the different attributes *x* influencing utility. We cannot directly measure utility of a certain alternative. But we know from random utility theory, that the farmer maximizes his or her utility by choosing alternative i (out of *j*) from which he or she expects the greatest utility. The probability that the farmer chooses alternative *i* is as high as the probability that the utility derived from *i* is higher than the utility from any other of the given alternatives *j* (Adamowicz et al., 1998).

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

Under the condition that the error terms ε_{nj} are independent und identically distributed, equation (2) can be converted into equation (3) (Train, 2009).

(3) $P_{ni}=\frac{e^{\beta' x_{ni}}}{\sum_j e^{\beta' x_{nj}}}$

Equation (3) is the conditional logit function whose parameters β are estimated with a maximum likelihood estimator. Conditional logit (CL) models come along with the assumption that parameters are unique for all respondents. Since this is behaviorally inappropriate, we apply a random parameter logit (RPL) model for estimation processes in our work. It takes into account heterogeneity of parameter values β over decision makers *n* with density $f(\beta|\theta)$ where θ refers e. g. to the means and the covariates of parameters β.

(4) $U_{nj}=\beta'_n x_{nj}+\varepsilon_{nj}\quad \beta_n \sim f(\theta)$

In the RPL estimation procedure, distribution moments of β_n, such as means and covariates, are estimated. This works by simulation of different distributions of coefficients β_n with density $f(\beta|\theta)$. The functional form (e. g. normal distribution) of the distributions needs to be predetermined by the researcher. By maximum likelihood estimation, simulated distributions are computationally repeated and optimized until the calculated choice probabilities are as close as possible to the observed choices. Choice probabilities are calculated with an open-form integral over all possible parameters β_n

(5) $P_{ni}=\int_{\beta_n} L_{ni}(\beta_n) f(\beta_n|\theta) d\beta_n$,

where $L_{ni}(\beta_n)$ is the standard logit probability (NARJES and LIPPERT, 2014).

Once the parameters are estimated, it is useful to interpret them by means of willingness to accept (WTA). WTA expresses the marginal need for compensation (remuneration) associated with level (or one unit) change in a variable. In other words, how much more or less remuneration, does the farmer expect if one protection measure variable changes the level (or unit). In our case, for example the change from the period of one year to five years. WTA is calculated by establishing the negative ratio of the variable parameter $\beta_k$and the remuneration parameter β_c.

(6) $WTA = -\frac{\beta_k}{\beta_c}$.

2.2 Hypotheses and experimental design

Based on literature research, interviews and group discussions with farmers, who tested the lapwing plot between 2015 and 2017, we worked out options how to design the protection measure. We were guided by the two partly conflicting aims of achieving the highest possible breeding success and complying with certain regulatory and administrative standards so that the measure can be implemented in the framework of an agri-environmental program. The group discussions took place in September 2017 in Braunschweig (region with predominate sugar beet and silage maize cultivation) and Münsterland (predominate silage maize cultivation). The aim was to discuss the acceptance of the measure options, to refine their design and to derive working hypotheses. Table 1 lists the attributes and levels that we finally used in the discrete choice experiment (DCE) (columns 1 and 2). Columns 3, 4 and 5 show one example of a choice card, i.e. different combinations of attribute levels that we presented the farmers and from which they could choose.

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

Attribute levels	**Attribute**	**Example of a choice card**		
		Option A	**Option B**	
• Bare soil, no seeding: soil cultivation until 15.03. • Open sward: seeding with a grass clover mixture until 15.03.	Seeding with a grass clover mixture	Seeding	No seeding	No participation
• On the edge of the field • In the field	Position of the lapwing plot	On the edge of the field	In the field	
• Marking of lapwings' nests • No marking	Obligatory marking of nests on cultivated part of the field	No	No	
One year / five years	Contract duration	Five years	One year	
• Low: 7 % of remuneration • High: 7 % of remuneration + 3 % of the farm's direct payments	Level of sanctions in case of an infringement	High	Low	
700 / 1000 / 1300 / 1600 €/ha	Remuneration	1300 €/ha	700 €/ha	

Source: Author

The first attribute describes that the farmer either seeds the lapwing plot with a grass clover mixture (until 15.03.) or he alternatively creates bare soil conditions by for example harrowing (until 15.03). Seeding establishes an open sward that creates cover for the chicks to hide from raptors. Further, the grass clover mixture shall prevent the establishment of weeds. However, farmers may fear that the grass clover mixture actually leads to weeds on the lapwing plot that could spread to other parts of the field. Moreover, seeding means additional work for the farmer.

The second attribute describes the lapwing plot's position in the arable field. Most farmers that we discussed with prefer the plot to be on the edge of the field, because it is easier to manage with machinery. However, the position within the field is advantageous for the breeding success because fewer disturbances can be expected (e.g. from dogs on roads). SHELDON et al. (2007) even identified distance of the lapwing plot to field boundaries as one of the best explaining variables for chick survival rates.

The third attribute implies the option that lapwing nests are marked so that farmers drive around them when applying cultivation measures. This refers to the cultivated part of the arable field and not the lapwing plot itself (where cultivation measures are forbidden). Lapwings not only breed on "their" plots, but also on the rest of the field, so that marking these nests is an additional measure to increase breeding success. From the farmers' point of view, driving around nest markings is an additional effort. But they don't have to make the markings themselves. This is done by local ornithologists.

Attributes 4 and 5 (period of the measure and level of sanctions) are decisive to whether the measure can be co-financed by the European Union's (EU) European Agricultural Fund for Rural Development (EAFRD). Both a minimum participation period of five years (EU, 2013: Article 28(5)) and the type of sanctioning (COM, 2014: Articles 15ff.), described as high in Table 1, are linked with EAFRD compliance.

Attribute 6 implies the potential remuneration levels that we derived from gross margin calculations for different crops so that they compensate yield losses. Some of the levels have been tested during field trials with farmers. The lowest and the highest levels represent the lower and the upper bound of what we consider to be a realistic range.

Against the background of the arguments given above, we derived the following hypotheses with regard to attribute level preferences:

1. *The higher the yearly remuneration payments per ha, the greater the probability that farmers participate in the protection measure.*
2. *Farmers prefer the lapwing plot to be on the edge of the field rather than in the middle of the field, so that this position increases participation probability.*
3. *Marking nests on the cultivated part of the field reduces the benefit of the measure from the farmer's point of view so that it reduces participation probability.*
4. *The preference for either bare soil or open sward on the lapwing plot varies among farmers. This should be reflected in parameter standard deviations markedly different from zero.*
5. *Farmers prefer the measure period to be one year instead of five years so that the one-year period increases participation probability.*
6. *Farmers prefer the measure if the sanction level is low instead of high so that the low sanction level increases participation probability.*

We further hypothesized the probability of participation in dependence of farmers' and the farms' characteristics:

7. *Farmers with a high or very high affinity towards protection of rare animal species are more likely to participate.*
8. *Farmers with experience in area-based measures are more likely to participate.*
9. *Farmers with a high share of unproductive or unfavorable arable fields are more likely to participate.*

In the survey, farmers were first generally introduced into the lapwing plot. Then we presented a list of compulsory funding requirements that had been consolidated from the field trials, e.g. range of plot size and minimum distances to woods and roads. Subsequently, the farmer was presented and explained with different attributes and attribute levels. In the next step we presented the farmer with choice cards for which we gave an example in Table 1.

Since there are numerous ways to combine attribute levels in the choice cards, we used N-gene software to determine the combinations. In the pretest (with 19 farmers) we used an orthogonal design for the determination. From the parameter estimations of the pretest we determined priors to create an efficient design of choice cards for the final survey. An efficient design enables parameter estimation with as low as possible standard errors (CHOICEMETRICS, 2014). We optimized the efficient design for analysis with random parameter logit models and yielded a D-error of 0.08. In the final design, we used 20 choice cards with 2 blocks, i. e. each respondent answered 10 choice cards. The sequence of choice cards was shuffled for each respondent.

In the second part of the survey we asked the respondents about their attitudes towards the protection of rare species and their experience in protection measures comparable to the lapwing plot. Further we asked respondents to provide information on their farm (e. g. number of livestock) and socio-economic characteristics (e. g. age).

2.3 Survey and sampling

We conducted the survey from January to March 2018 via the online panel "agri EXPERTS" (https://www.agri-experts.de) and the website "agrarheute.com". A total of 284 farmers cultivating spring crops fully completed the survey. However, we only evaluated 270 questionnaires because 14 respondents spent less than 8 minutes completing the survey. We consider this period to be too short to ensure a meaningful answer to the questions. The distribution of the participation duration among respondents shows that the number of respondents rises sharply from 8 minutes, so that we assume a meaningful survey duration from this point. Of the 270 respondents, 211 (78 %) came from the panel and 59 (22 %) from the website. The panel includes 1209 arable farmers, so that for the panel a response rate of 17 % could be achieved.

In the following we compare our sample with the total population in terms of important characteristics (Table 2) such as size of farm and arable land which constitutes the target area of the lapwing plot. The total population represents all farmers in Germany who cultivate spring crops. However, the agricultural structure in Germany differs considerably in different areas so that farms cannot be directly compared. That is why Table 2 not only shows the whole sample (column 3), but we have divided our sample and the total population into regional subgroups (THÜNEN ATLAS, 2010; STATISTISCHE ÄMTER DES BUNDES UND DER LÄNDER, 2016). Column 4 shows that in our sample 126 respondents come from the German federal states of Schleswig-Holstein, Lower Saxony and North Rhine-Westphalia. These states have a comparable agricultural structure and the respondents are thus grouped in the region “North”. We compare this group with the total population of farmers originating from these federal states and cultivating spring crops (column 5) (RDC, 2016). 93 respondents are from Baden-Württemberg and Bavaria who we grouped in the region “South”. The remaining 51 respondents come from different federal states. Here, however, the number of cases is so small that we do not consider a comparison with the total population useful.

In the sample, farms from the North are overrepresented with a share of 47 % in comparison to a share of 33 % in the total population, whereas farms from the South are underrepresented. In both regions, farms in our sample are larger than in the total population, in the North the respective percentiles are roughly twice as large as in the population. In the South, differences are a bit less pronounced. Accordingly, the size of arable land per farm is double as high or even more in both regions. Also, the share of arable land per farm is larger in the sample than in the total population. With regard to livestock, 50 % (median) of respondents in both regions do not have any livestock at all which is not the case in the total population. With regard to the 75th percentile we observe livestock units per ha considerably lower than in the total population. Only for 5 % of the farms in our sample (95th percentile) we observe livestock density that is greater than in the total population. Also, the share of farms with cattle are much lower in our sample with about 30 % versus about 50 % in the total population.

The share of farms cultivating different spring crops in our sample is mostly comparable with the total population. Differences are usually up to about 10%. Only the share of farms growing sugar beet is considerably higher in our sample than in the total population. The age of the farms' operating managers is overall comparable.

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

Variable		**Survey data overall**	**Survey data North**	**FSS North**	**Survey data South**	**FSS South**
Number of farms	Number	270	126	55857	93	85897
Share of total farms (%)	Percentage	100	47	33	34	50
Farm size (ha)	25th Percentile	46	63	28	25	16
	Median	100	120	57	50	30
	75th Percentile	178	180	99	110	57
Arable land per farm (ha)	25th Percentile	28	45	17	18	9
	Median	76	95	39	35	19
	75th Percentile	150	150	74	92	41
Share of arable land per farm (%)	25th Percentile	64	80	58	60	52
	Median	90	95	85	82	75
	75th Percentile	99	100	98	97	94
Livestock units per ha	5th Percentile	0	0	0	0	0
	25th Percentile	0	0	0	0	0
	Median	0.02	0	1.05	0	0.54
	75th Percentile	0.84	0.99	1.95	1.01	1.36
	95th Percentile	2.92	3.88	3.43	2.91	2.31
Share of farms with…						
cattle (%)	Percentage	33	30	52	33	49
spring barley (%)	Percentage	22	23	17	23	26
oats (%)	Percentage	18	14	10	18	19
grain maize (%)	Percentage	19	13	18	27	20
silage maize (%)	Percentage	54	60	70	49	63
sugar beet (%)	Percentage	38	52	19	22	13
potatoes (%)	Percentage	10	11	13	10	17
Age of the farm's operating manager	5th Percentile	30	29	33	32	32
	25th Percentile	40	40	45	42	44
	Median	50	49	52	51	51
	75th Percentile	56	55	58	56	58
	95th Percentile	63	62	65	62	65

FSS= Farm structure survey. 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: RDC (2016) and own calculations.

2.4 Model specifications

We used NLOGIT 6 econometric software to analyze the discrete choice experiment data. As each of the 270 respondents answered 10 choice sets, we had 2700 choice observations. The attributes entered the estimated model as dummy variables (Table 3). We attributed value one to the options given in plain text. Only for the attribute "remuneration" a quantitative variable was assigned, which means that the coefficient expresses the utility increase of one unit (Euro). The constant enters the model as dummy variable with value one for participation in the protection measure (either option A or B). The constant expresses the utility of participation independent of the attributes. For econometric analysis we use the RPL model, because in comparison to the CL model, it takes into account preference heterogeneity among respondents (cf. chapter 2.1). Further the RPL model relaxes the CL assumption of independence of choices. The CL assumption of independence of irrelevant alternatives was in our case not violated (insignificant results of the Hausman test), but for the reasons given above we still use the RPL model (Hensher et al., 2015). All attributes were randomized with 100 Halton draw sequences and the assumption of normal distributions. Only the parameter "remuneration" is fixed so that we are able to determine economically meaningful WTA estimates. Covariates entered the model as (non-random) interaction terms with the constant.

3. Results

Table 3: Random Parameter Logit results

Variable	Coefficient	Standard error	p-value Wald test	95% confidence interval	
Random parameter means					
Plot at the edge of the field *vs in the field*	.127	.113	.263	-.095	.349
No marking of nests *vs marking of nest*	.630	.106	.000	.423	.836
Bare soil *vs open sward*	-.420	.132	.002	-.680	-.160
5 year length *vs 1 year length*	-1.45	.151	.000	-1.750	-1.158
Low sanctions *vs high sanctions*	1.393	.127	.000	1.145	1.641
Random parameter standard deviations					
Plot at the edge of the field	1.027	.150	.000	.733	1.320
No marking of nests	.879	.180	.000	.525	1.232
Bare soil	1.327	.134	.000	1.064	1.590
5 year length	1.635	.250	.000	1.145	2.124
Low sanctions	1.494	.310	.000	.887	2.101
Nonrandom parameters					
Remuneration	.003	.000	.000	.002	.003
Constant (**Option A or B** *vs no participation at all*)	-5.016	.335	.000	-5.672	-4.360
Covariates					
Constant(C)*Affinity for protection of rare species	.823	.223	.000	.386	1.261
C*Experience with area based measures	.778	.195	.000	.396	1.160
C*At least 5% unproductive plots	.803	.197	.000	.417	1.189
Model statistics					
N	2700	Log-likelihood(LL)		-2058	
AIC/N	1.543	McFadden pseudo R^2		.3059	

Source: Author

Overall, the model has a good fit with a pseudo R^2 of 0.3 (HENSHER et al., 2015) and a chi-square of 1815 with 24 degrees of freedom[2]. Coefficients of non-random parameters and coefficient means of random-parameters have the expected signs. Most of them support hypotheses 1-3 und 5-6 given in chapter 2.2. Only the coefficient mean associated with hypothesis 2 (location of the lapwing plot) is subject to a high degree of uncertainty reflected by the high standard error. We did not hypothesize on a general preference for either bare soil or open sward conditions on the lapwing plot. Results show that on average there is a preference for open sward since bare soils decrease utility in comparison to open sward. In this context, we rather hypothesized that preferences vary among farmers. The corresponding hypothesis 4 is supported by a random parameter standard deviation markedly different from zero. All other random parameter standard deviations are also markedly different from zero expressing heterogeneity in preferences. The reasons for this require further analysis, for example with the latent class model.

The coefficient for the constant is negative. This result is not surprising since it expresses the utility of participation independent of the attributes, thus independent of remuneration. We further tested the influence of farmers' and farms' characteristics on the participation probability (hypotheses 7-9) by creating interaction terms of the characteristics and the constant. The coefficients' positive signs indicate that farmers with an affinity for the protection of rare species and farmers with experience with area-based measures (e. g. flowering strips) are more likely to participate in the lapwing plot than those farmers not having the corresponding affinity or experience. Further, farmers who manage at least 5 % of unproductive or unfavorable arable land (small, difficult to reach, often wet) have a higher participation probability than those farmers managing less than 5 % of such land.

From the coefficients in Table 3 we can derive the mean willingness to accept (WTA) estimates given in Table 4. For the variable "location of the lapwing plot" the estimate is small and subject to a high degree of uncertainty as is the corresponding coefficient given in Table 3. For all other attributes and covariates, the picture is less ambivalent. For example, if no nest markings are made, the expected remuneration declines on average by 235 €/ha. Farmers with an affinity for the protection of rare species on average expect a lower remuneration for the protection measure of about 300 €/ha, independent of specific attributes.

Table 4: Willingness to accept (WTA) for attributes and covariates

Variable	Mean WTA (€/ha)	Standard error (€/ha)	95% confidence interval (€/ha)	
Attributes				
Plot at the edge of the field *vs in the field*	-47	42	-130	36
No marking of nests *vs marking of nest*	-235	40	-312	-157
Bare soil *vs open sward*	157	49	61	252
5 year length *vs 1 year length*	542	59	426	657
Low sanctions *vs high sanctions*	-519	53	-623	-416
Covariates				
Affinity for protection of rare species	-307	84	-472	-142
Experience with area based measures	-290	74	-435	-145
At least 5% unproductive plots	-299	75	-447	-152

Source: Author

[2] We refrain the discussion of significance tests because we do not claim that our sample is representative of all farmers growing spring crops in Germany. The comparison between the sample and the total population has shown that there are some structural differences, e.g. in the farm sizes. However, significance tests refer only to random errors (WASSERSTEIN and LAZAR, 2016).

4. Discussion and Conclusion

Results show that especially those attributes associated with EAFRD compliance strongly reduce farmers' acceptance. A minimum participation period of five years and the type of sanctioning linked with EAFRD compliance particularly lower the probability of participation or alternatively raise the compensation requirement. Preference for short-term contracts is in line with RUTO and GARROD's (2009) results and with the often documented general preference for flexibility in agri-environmental schemes (ESPINOSA-GODED et al., 2010; BROCH and VEDEL, 2012). Further our results on sanctions are in line with the general disutility of fines and monitoring observed in BROCH and VEDEL (2012) and ALLÓ et al. (2015). The fear of EAFRD sanctions is documented in EAFRD evaluation literature (PABST et al., 2018), but is quantified in our analysis (WTA).

Farmers' preferences do not necessarily have to contradict ecological requirements since also from an ecological point of view, a shorter participation period of one year makes sense. The lapwing shifts its territory to breed every year within a certain radius, depending primarily on the overall supply of bare soil in spring. Other attribute preferences constitute an economic-ecological trade-off. For example, marking of nests increases the breeding success, but WTA for this attribute is 235 €/ha. Interestingly, farmers who participated in the field trials were satisfied with a remuneration of 50 € for the marking and frequently did not expect any money at all. This discrepancy could mean that payment expectations may be significantly reduced with appropriate advice and experience. On the other hand, this could also indicate a selection bias among farmers participating in the field trials.

Farmers' and farms' characteristics have a comparably high importance for acceptance. WTA estimates are all around 300 €/ha which is less than for EAFRD related measure attributes, but more than for the other measure attributes, such as marking of nests. However, the relationship between characteristics and attribute preferences need further investigation in order to explain part of the preference heterogeneity.

We cannot attest that our sample is representative of all German farmers growing spring crops. A comparison between our sample and the farming population was only possible for some criteria for which population data are available. Based on these data, we assume that we somewhat overestimate willingness to participate. In comparison to the total population, farmers in our sample have more arable land and need less land for manure disposal (fewer animals). Thus they probably have higher degrees of freedom to provide ecological services such as the lapwing plot than the farmers of the entire population.

Furthermore we surveyed both farmers in areas with and without lapwing population, thus we also interviewed farmers in non-target areas. We do not consider this to be problematic, because our survey is about the general acceptance of an agri-environmental measure, regardless of whether the measure may be used by the interviewee. Nevertheless, based on the postal code we identified those respondents who come from an area with lapwing population (103 cases) and those who do not (167 cases). We evaluated the choice experiments with the two sub-groups separately and did not find substantial differences in the results.

Overall, our result identified weak spots of biodiversity protection schemes, especially regarding those attributes associated with EAFRD compliance. The high WTA sums related to this subject show that the usual remuneration calculation of agri-environmental measures (compensation of income loss) compensates the farmers' utility loss only partially. In this context we think that the proposals for the CAP past 2020 (COM, 2018a) offer three levies to achieve an increased implementation of environmental friendly farming practices. First, the maximum support rates for agri-environmental schemes defined in Annex II of EU-regulation 1305/2013 are dropped. These rates are too low for the lapwing plot, especially because the lapwing breeding range is often in areas with intensive agriculture. Second, the member states must define the control and sanctioning system. We regard this as a chance to create a system that is more comprehensible and transparent to farmers (COM, 2018b: Articles 57ff.) in comparison to the current sanctioning system which constitutes one of the greatest barriers of acceptance. Third, the new instrument of Eco-Scheme defined in Art. 28 of COM (2018a) could be a promising tool, because it may be implemented under the first pillar, a system that farmers are familiar with so that a lower entry barrier can be expected. Furthermore, farmers have only an annual obligation and can modify their decision (extent and location) till mid-May, which suits their preference for flexibility and short-term contracts.

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