Farmers' preferences over alternative AECS designs. Do the ecological conditions influence the willingness to accept result-based contracts?

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Introduction

Objective: contribute to the ongoing discussion on whether it better to pay farmers for actions or results, or both.

- Discrete Choice Experiment (DCE) to:
  - ❖ Investigate preferences for alternative contract designs;
  - ❖ Link preferences to farm structural and ecological characteristics.

Question 1 Do farmers prefer result or hybrid-based schemes over action-based schemes?

Question 2 Do the ecological conditions and farm structure influence farmers' willingness to adopt the different approaches?

Methods

Case study

- Federal State of Bavaria
- Different approaches already exist (KULAP 2015-2022)

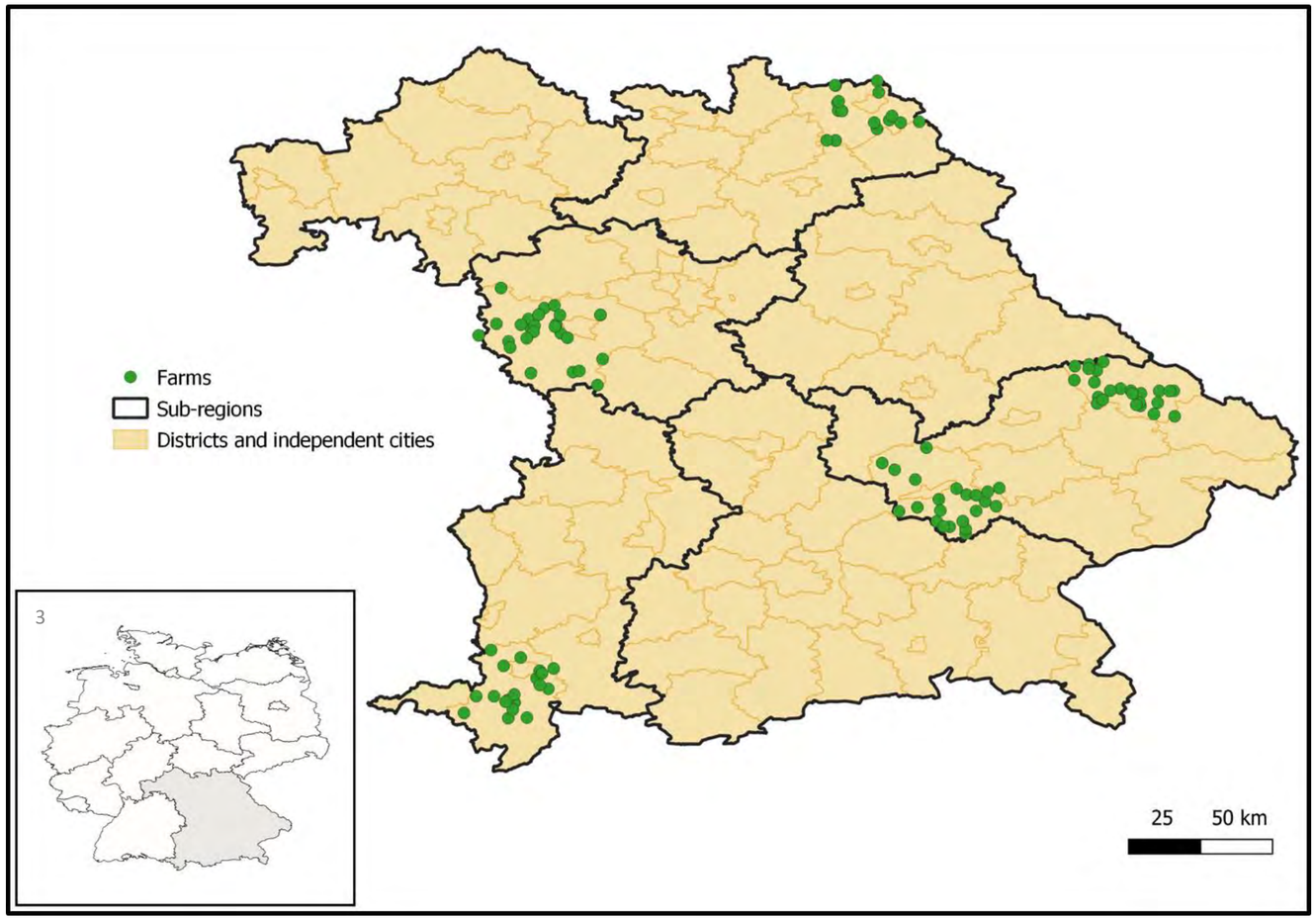
Sample

- In person data collection.
- Sample of 107 grassland farms.

Ecological data

- Species richness recorded plot level using method of pilot scheme B40.
- Farm level biodiversity index:

$$Biodiversity\ Index_i = \frac{\sum_{j=1}^{4} n_{ij} * area_{ij}}{grassland\ area_i}$$



Methods

Experimental design

Attribute selection based on:

- KULAP offer
- Q-methodology

Combination of attibutes determines the approach:

- Action-based (ABS)
- Result-based (RBS)
- Hybrid-based (HBS)

Contract attributes	Attributes levels	Description
Practice	Late mowing (1.07) Maximum LSU (1.4 LSU/ha) None	Binary
Baseline payment (€/ha)	0€, 100€, 200€, 250€	Continuous
Ecological result	0, 2, 4 or 6 indicator species	Continuous
Ecological payment(€/ha)	0€, 100€, 200€, 300€	Continuous
Monitoring	Farmer Authority	Binary

ID. Block.Card.	Measure 1	Measure 2	None
What are you rewarded for?			
Pre-defined sustainable practice	Late mowing (01.07)	-	
Basic payment	100 €	-	
Ecological result	2 Species	4 Species	
Ecological payment	100 €	300 €	
Who does the monitoring of compliance?			
Monitoring	Farmer	Authority	
In which measure would you participate and how many hectares would you enroll?	❑ ..... ha	❑ ..... ha	❑

Methods

Analytical framework

Three steps approach:

1. **Mixed logit** (Train, 2009)
2. **Latent class** (Boxall and Adamowicz, 2002)
3. **Land allocation analysis** (Kuhfuss et al. 2016)

Two stage methodology to control for selection bias

- farmer indicated intensity of participation in hectares $y_{nit} \geq 0$
- land enrolled is expected to be $y_{nit} = Z_{nit}\,\alpha + u_{nit}$
- predicted probabilities of choosing each alternative from mixed logit included in OLS regression as correction parameters.

Results
Mixed logit

Parameters	MXL I				MXL II			
	Mean		SD		Mean		SD	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Total payment	0.005***	0.001			0.005***	0.0009		
Late mowing (base: none)	-2.359***	0.399	1.197***	0.344	-2.242***	0.364	0.916**	0.311
Maximum LSU (base: none)	-1.220***	0.362	1.726***	0.284	-1.255***	0.343	1.684***	1.850
Indicator species	-0.487***	0.078	0.244***	0.059	-0.456***	0.076	0.238***	0.238
Monitoring (base: authority)	0.537***	0.174	0.734***	0.243	0.522***	0.163	-0.489*	-0.545
ASC: Result-based (RBS)[a]	0.476	0.399	1.012***	0.327	-0.027	0.433	1.024***	0.327
ASC: Hybrid-based (HBS)[a]	0.681*	0.402	1.372***	0.360	0.694*	0.416	0.657*	0.360
RBS*BI					0.215*	0.123	0.048	0.765
HBS*BI					0.048	0.119	0.016	0.929
Log likelihood	-576.628				-546.230			
Pseudo-R2								
AIC	1179.257				1126.461			
N. obs.	1926				1818			
N. farmers	107				101			

[a] The alternative specific constants were coded as the result based (RBS) and hybrid based (ABS) option respectively.
Note: *, **, *** represent significance level at 10, 5, and 1 percent, respectively.

Results

Latent class

	Class I		Class II	
	Coef.	Std. Err.	Coef.	Std. Err.
Total payment	0.0001	0.0009	0.008***	0.001
Late mowing (base: none)	-1.774***	0.349	-0.041	0.686
Maximum LSU (base: none)	-1.131***	0.338	1.623**	0.655
Indicator species	-0.234***	0.059	-0.334***	0.090
Monitoring (base: authority)	0.821***	0.171	-0.096	0.223
ASC: Result-based (RBS)	0.293	0.385	1.393**	0.679
ASC: Hybrid-based (HBS)	0.891**	0.370	-0.416	0.758
Class share	(0.67)		(0.33)	
Membership variables				
Full time	1.291*	0.728		
Participation AECS	-2.076**	0.894		
Dairy farms	1.646**	0.785		
Milk cows	-0.0009	0.008		
Constant	0.579	0.862		
Log-likelihood	-552.029			
N. obs.	1926			
Farmers	107			

Results

Land allocation decision

Dependent: % of grassland allocated	Coefficient	Std. error
Total payment	0.0008***	0.0002
Late mowing	-0.324***	0.053
Indicator species	-0.005	0.016
Monitoring	-0.151***	0.0417
Result-based (RBS)	-0.226**	0.092
Hybrid-based (HBS)	-0.031	0.082
Biodiversity index (BI)	0.046***	0.010
m1	-0.195***	0.076
m2	-0.254***	0.082
m3	-0.483***	0.175
Intercept	-1.269**	0.504
N. obs.	386	

Discussion & Conclusions

Q.	Findings	Implications
1	❖ No clear preference for any approach. ❖ Payment mechanism is not only driver of farmers' choices. ❖ Applicability of practices, achievability of outcomes, and farm structure better explain preferences.	❖ Targeting farmers and tailor payments based on scheme's primary objectives. ❖ Some practices make farming impossible. ❖ HBS to induce extensification by intensive farms. ❖ RBS to induce maintainance by extensive farms.
2	❖ Farms with higher biodiversity tend to accept RBS more frequently, and are willing to enrol a greater share of their land. ❖ Awareness about farms' ecological potential influences uptake of RBS.	❖ Need to consider a potential lack of additionality. ❖ On-site technical advice to help farmers assessing their plots' is needed.

Thank You

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Appendix

Sample overview

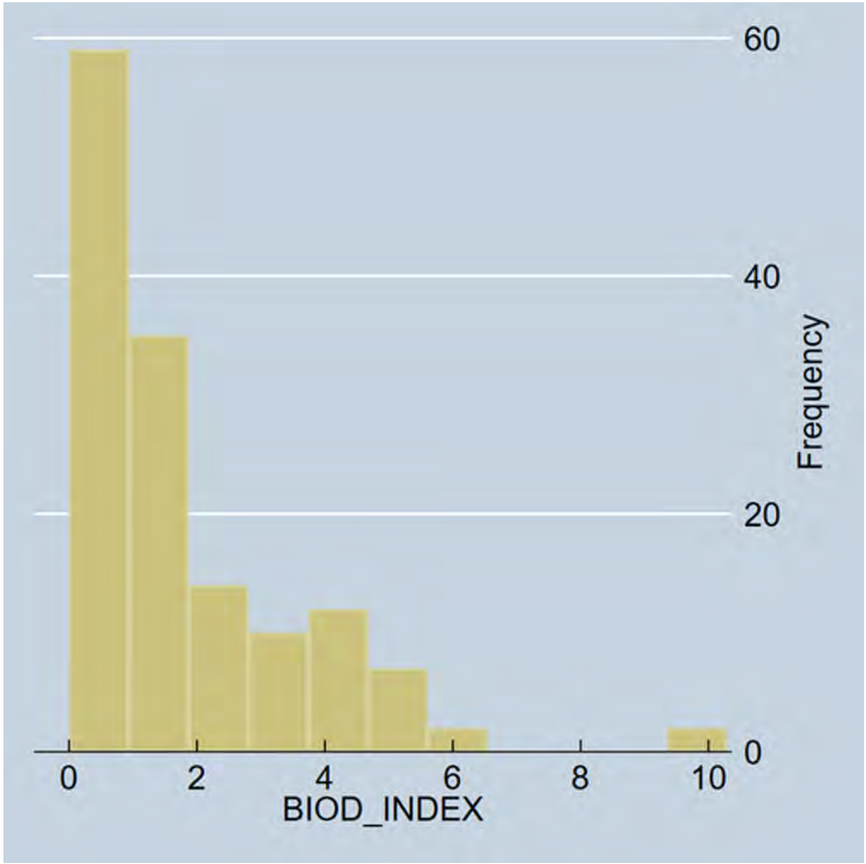
Variables		Sample[1]	Bavaria
Male (%)		86.9	-
Age by classes (%)	≤55years	54.2	55.9[a]
	≥55years	45.8	44.1[a]
Successor (%)		50,5	43.6 [a]
Agricultural education (%)		85.9 (34.7)	63.0[b]
Experience (years)		22.4 (13.6)	-
Average farm size (ha)		68.02 (64.7)	30,7 [b]
Average arable area (ha)		39.4 (32.8)	28.57 [b]
Average grassland area (ha)		36.9 (55.07)	13.33 [b]
Share of grassland		57.3 (31.7)	34.1 [b]
Share of rented land		46.1 (23.5)	51.0 [b]
Full-time farms (%)		73.8	43.3 [b]
Organic farms (%)		22.5	12.1 [b]
Dairy farms (%)		69	34[b]
Participation in AECS (%)		59.8	68.0[c]
	Result based	18.7	
	Action based	41.1	
	Not participants	40.2	
Population		107	75 309[d]
	Ansbach	23	2 392[d]
	Hof	16	843[d]
	Landshut	21	1 743[d]
	Oberallgäu	18	2 059[d]
	Regen	22	925[d]

Sources:
[a] Destasis (2020) – Note: takes into account only individual companies.
[b] StMELF (2022) – Note: refers to farms with milkcows farming.
[c] Destatis (2021) – Note: refers to all AECS payments, both for grassland and arable land.
[d] Destasis (2020) – Note: refers only to farms managing permanent grassland areas.

Appendix

Biodiversity index

Variable	Defining criteria	Mean (SD)	Min-Max	Total
Intensively used meadow (ha)	>2 cuts	18.58 (19.29)	0-97.5	2182
Extensively used meadow (ha)	≤2 cuts	6.38 (11.95)	0-90	652
Intensively used (mowing) pasture (ha)	>cuts or >1.4 LSU	2.4 (6.67)	0-40	278
Extensively used (mowing) pasture (ha)	≤cuts or ≤1.4 LSU	6.26 (37.02)	0-425	826
N. of species		2.58 (2.54)	0-13	
Biodiversity index		1.74 (1.86)	0-10.28	
Biodiversity index result-based farmers		2.39 (2.64)	0-10.28	
Biodiversity index action-based farmers		1.36 (1.34)	0-5.28	
Biodiversity index non-participants		1.48 (1.60)	0-5.27	
N. of plots			141	
N. of obs.			101	



Appendix

Willingness to accept

Estimated WTA values:

- Late mowing = 469.25 €/ha/year
- 4 species RBS = 388 €/ha/year

Revealed WTA (mean):

- Late mowing = 517.3 €/ha/year
- 4 species RBS = 367.3 €/ha/year

Attributes	Mean (€/ha/year)	Confidence interval	
Late mowing	-469.25	-347.43	-681.30
Maximum LSU	-242.61	-123.75	-358.58
Indicator species	-97.02[13]	-60.59	-160.44
Monitoring	106.83	209.63	38.35
HBS	94.82	362.05	54.25

Appendix

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