Farmers' preferences for practice and result-based agri-environmental contracts to conserve biodiversity

Wojciech Zawadzki (wm.zawadzki@uw.edu.pl), Katarzyna Zagórska, Mikołaj Czajkowski,
Wiktor Budziński, Solen Le Clec'h, Olimpia Markiewicz,
Bettina Matzdorf, Matěj Opatrný, Jens Rommel, Julian Sagebiel,
Christoph Schulze, Milan Ščasný, Lenny van Bussel

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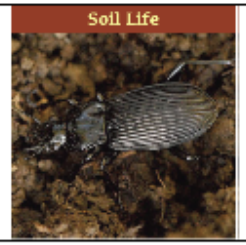
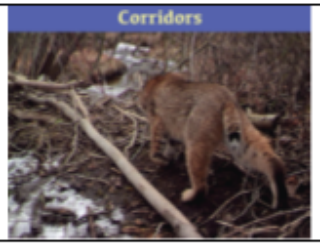
Research aim

- We investigate farmers' preferences for new agri-environmental-climate measures (AECM) that are aimed at the conservation of biodiversity on arable land, with a particular focus on the distinction between results-based and practice-based contracts. Our main research question is about to what extent farmers prefer practice-based contracts to result-based contracts. In addition, we want to observe if a collective-result-based bonus can work as additional incentive for farmers to enroll in the contracts. As a consequence of this study, farmers' adoption of AECM can be improved by advancing the available evidence on new design features of the payment schemes.
- Our results are relevant to the EU Common Agricultural Policy, as creating appropriate, properly balanced contracts can satisfy both farmers and society, ensuring the sustainability of biodiverse agriculture and efficiency of economic instruments used to support it.

Study description

- Stated preference choice experiment (DCE/VCE), CAWI, January-August 2022
- Recruitment: market-research company (series of screening out questions on the general panel)
- As a farmer, we qualified people …
  - …who were aged 18 or over
  - …who owned, leased, or rented arable land (>1 ha)
  - …who made management decisions (or took part in the decision-making process) about arable land
  - …whose total agricultural area in 2022 exceeded 1 ha
- Total sample of 1835 farmers from 4 countries:
  - Germany 421 farmers
  - Netherlands 512 farmers
  - Poland 804 farmers
  - Czech Republic 98 farmers
- 12 choice cards (12 owned land cs/ 12 leased land cs/6 owned land cs + 6 leased land cs)
- The experimental Batesian D-efficient design
- Modelling approach: mixed logit vs. multiple discrete-continuous extreme value (MDCEV) model- Bhat (2008)

Examples of ways in which biodiversity on different levels could be conserved and measured, as presented to farmers.

	Soil life	Soil cover	Water, nest and shelter features	Flowering and native plants	Plant structure and composition	Creating corridors for wildlife
						
Ways to conserve	rotating crops, reducing tillage, using cover crops, manure or compost, using cover crops in understory for perennial crop retaining untiled areas, which support ground-nesting insects, reptiles, amphibians, birds, and mammals	keeping the soil covered with plants (crops or other plants, including in under-storey for perennial crop) allowing non-invasive plants to grow along fences, roadways and in ditches leaving undisturbed strips of cover crop when mowing or haying a grassland as refuge for animals	reducing water use by planting crops appropriate for climate, increasing soil organic matter and irrigation efficiency supporting animals with in-field puddled water or small ponds, create brush piles, bee blocks, nest boxes, nest platforms and other suitable shelters and nests for animals	using sequentially flowering or native plants interspersed in crops, in the understory, or at the ends of crop rows retaining at any time, at least part of one field with a flowering crop or cover crop in crop perimeters, and in natural areas on the farm, conserving plants that provide berries and seeds as food	increasing diversity in crop perimeters, and in natural areas on the farm (plants that have stems with hollow centers, retaining snags, downed, decomposing logs, shrubs, wildflowers, grasses and leaf litter) allowing natural habitats to recolonize some patches	connecting natural areas on and off the farm allowing larger animals access through the farm, using wildlife friendly fencing
Ways to measure	soil sampling and analysis: measurement of organic matter	soil sampling and analysis: measurement of erosion, nitrogen absorption, phosphorus status	existence of various habitats and their elements, abundance of selected species	satellite imagery, flower color index	satellite imagery, structuring degree of agricultural patches	patch diversity index, Shannon diversity index

A summary of the descriptions of the contract types, as presented in the survey

Practice-based contract requires the adoption of ALL of the following practices: 1) Introducing winter cover crops and stubble intercrops (catch crops) 2) Using at least five different main crop types, including the cultivation of legumes, with a minimum share of 10% each 3) Allocating at least 10% of the arable land covered by the contract to flowering field margins and winter bird use 4) Allocating at least 10% of arable land covered by the contract to set-aside
Results-based contracts allow farmers to choose ANY practices they want. [+ the list of potential practices] – If you implement the same practices as required by practice-based contract, your remuneration will be approximately the same; – If you implement additional practices, or choose other practices that will be more effective for conserving or increasing biodiversity at your farm, your remuneration will be larger; – If you implement fewer practices or other practices that will be less effective, your remuneration will be lower.
No contract means no obligations and no additional payments.

Choice cards

- example

	Practice-based contract	Results-based contract	No contract
Annual payment per ha of arable land enrolled in the contract	200 EUR (fixed if practices are implemented)	112 – 448 EUR (depending on measured biodiversity level)	0 EUR
Bonus payment depending on the biodiversity of the farm's environs (annually, per ha of arable land enrolled)	8 – 32 EUR (depending on the measured biodiversity level of the area surrounding your farm)	19 – 29 EUR (depending on the measured biodiversity level of area surrounding your farm)	0 EUR
How much arable land would you enroll?	____ ha	____ ha	____ ha

Choice cards
- example

Practice-based contract - remunerated for implementing specific practices for arable land enrolled in the contract. In this case, whether or not you implemented the practices according to the contract requirements would be monitored.

	Practice-based contract	Results-based contract	No contract
Annual payment per ha of arable land enrolled in the contract	200 EUR (fixed if practices are implemented)	112 – 448 EUR (depending on measured biodiversity level)	0 EUR
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How much arable land would you enroll?	____ ha	____ ha	____ ha

Result-based contract - remunerated for the expert-measured biodiversity level of the arable land enrolled in the contract. The measurement takes into account various characteristics of the farm, such as soil life, flowering and native plants, and ecological corridors, and combines them to assign a single biodiversity index result for all the land enrolled in the contract.

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Attribute	Levels
Annual payment (mean)	50, 75, 100, 125, …, 300 EUR
Annual payment (variation)	For practice-based contracts: 0 (fixed) For results-based contracts: 0.1,0.25,0.5
Bonus payment (mean)	10, 20, 30, …, 60 EUR
Bonus payment (variation)	0.1,0.25,0.5

Results – MXL in preference space

	Means	Standard Deviations
ASC: Practice	1.84***	4.53***
ASC: Results	0.67***	4.55***
Annual payment (100)	0.5***	1.11***
AP varation	-0.02	0.08**
Bonus payment (100)	0.39***	2.04***
BP variation	0	0.74**

Baseline model (without interactions)

Baseline model with country-specific interactions (base level: DE)

	Means	Standard Deviations	PL	NL	CZE
ASC: Practice	1.01***	4.5***	1.34***	2.71***	1.43***
ASC: Results	-0.07	4.55***	1.18***	2.7***	0.67
Annual payment (100)	0.35***	1.07***	0.43***	-0.45***	0.06
AP varation	0.17	0.07***	-0.2	-0.09	-0.29
Bonus payment (100)	0.28	2.07***	0.54*	-0.23	-0.4
BP variation	0.13	0.73**	-0.41**	-0.13	0.41

Results – MXL in preference space

	Means	Standard Deviations	F3: Trust EU	F3: Trust Ministry	F3: Trust Ag Experts	F3: Trust Scientisis	F3: Trust EnvOrg	F3: Trust Ag Advisors
ASC: Practice	2.01***	4.4***	-0.02	0.39**	0.33	-0.44**	1.38***	-0.38**
ASC: Results	0.85***	4.39***	-0.02	0.27	0.48**	-0.38**	1.51***	-0.52***
Annual payment (100)	0.5***	1.06***	-0.05	-0.23***	0.05	0.15***	-0.08*	0.04
AP varation	-0.01	0.07***	0.02	-0.01	-0.01	0.04	0.08**	-0.12***
Bonus payment (100)	0.41***	2.01***	-0.34*	0.19	-0.23	0.33*	0.19	-0.16
BP variation	-0.01	0.71***	0.05	-0.04	0.06	0.04	-0.28***	0.03

% F3. Below we list various groups and organizations. Please indicate, to what extent you trust or do not trust each of them.
% 1. Do not trust at all
% 2. Do not trust very much
% 3. Don't know / hard to say
% 4. Trust a little
% 5. Trust a lot

% F5. How do you see yourself: are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?

% Please tick a box on the scale, where the value 0 means: 'not at all willing to take risks' and the value 10 means: 'very willing to take risks'.

	Means	Standard Deviations	F5: Risk tendency (norm.)
ASC: Practice	1.91***	4.46***	0.99***
ASC: Results	0.73***	4.48***	1.05***
Annual payment (100)	0.49***	1.08***	-0.17***
AP varation	-0.03	0.08***	-0.04*
Bonus payment (100)	0.38***	2.07***	-0.47***
BP variation	0.01	0.73***	-0.15*

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ASC: Practice	1.91***	4.46***	0.99***
ASC: Results	0.73***	4.48***	1.05***
Annual payment (100)	0.49***	1.08***	-0.17***
AP varation	-0.03	0.08***	-0.04*
Bonus payment (100)	0.38***	2.07***	-0.47***
BP variation	0.01	0.73***	-0.15*

Results – MXL in preference space

	Means	Standard Deviations	G5: Organic
ASC: Practice	0.37*	4.45***	2.59***
ASC: Results	-0.98***	4.48***	2.87***
Annual payment (100)	0.84***	1.04***	-0.58***
AP varation	-0.03	0.08***	0.02
Bonus payment (100)	0.8***	2.07***	-0.68**
BP variation	-0.04	0.77**	0.08

% G5. Are your farm's products certified as organic?

% 1 Yes, the whole farm production is classified as organic
% 2 Yes, part of the farm production is classified as organic, but part of it is classified as conventional
% 3 The farm is under conversion to organic production
% 4 No, none of the production is classified as organic

% G8. Do you undertake other activities beneficial for the environment on your farm? (Ex. limiting the use of pesticides, solar panels and adaptation to climate change)

% a Yes
% b No

	Means	Standard Deviations	G8: Currently other env-measures
ASC: Practice	0.94***	4.62***	1.31***
ASC: Results	-0.05	4.63***	1.04***
Annual payment (100)	0.89***	1.06***	-0.56***
AP varation	0	0.08**	-0.04
Bonus payment (100)	1.01***	2.03***	-0.92***
BP variation	0,1	0.8**	-0.13

	Means	Standard Deviations	G7: Currently bio-measures
ASC: Practice	-0.27	4.48***	2.44***
ASC: Results	-1.42***	4.5***	2.42***
Annual payment (100)	0.8***	1.09***	-0.33***
AP varation	0.07	0.08***	-0.1
Bonus payment (100)	0.52	2.38***	-0.14
BP variation	0.58**	0.79**	-0.65***

% G7. Do you currently implement other measures that promote biological diversity?
% a Yes
% b No

Conclusions

- Farmers' preferences for results-based and practice-based biodiversity-enhancing agri-environmental-climate contracts were investigated.
- On average, farmers prefer practice-based contracts over results-based contracts but both types of contracts were preferred to no contract.
- Annual payments per ha and bonus payments paid for the observed landscape biodiversity levels (associated with actions of all farmers in the region) were significant factors for farmer choices.
- No significant positive or negative preferences towards the variation of the annual or bonus payments were found.
- Substantial heterogeneity of farmer preferences was observed. Drivers of this heterogeneity were investigated. Respondents with larger farms, who have prior experience with agri-environmental contracts, who are certified as organic and who are more risk tolerant were more willing to enter into innovative results-based contracts.

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