Drivers of farmers' willingness to adopt extensive farming practices in ecologically valuable river valleys

– the case of Biebrza Marshes

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Why?

- negative biodiversity trends → agricultural sectors as major contributor

(Henle et al., 2008; Foley et al., 2005; Global assessment report on biodiversity and ecosystem services – PBES 2019)

- reliance on voluntary participation: limited uptake of agri-environmental schemes in the European Union
- CAP 2021-27 environmental and climate ambitions
- goal: identify factors affecting farmers' willingness to participate in agri-environmental contracts

Conservation objectives vs. Economic objectives

Study description

Method

- discrete choice experiment on uptake of agri-environmental schemes (AES)
- CAPI by rural advisors
- 470 farmers, who make managerial decisions
- June – August 2017 & March 2018

Measures

- willingness to accept for AES
- factors explaining heterogeneity of farmers' preferences
  - farm and farmer's characteristics
  - knowledge and information

DCE attributes

Attributes	Description			
Practices	**Arable land** - improved utilization of fertilizers - crop diversification - catch crops	**Peatland** basic or extended protection	**Meadows** extensive mowing and grazing	**Livestock / mixed production** reduction of Livestock Unit/ha
Duration	the contract will last for a specified number of years			
Termination	possibly to terminate a contract with/without a requirement to pay back the subsidies one have acquired			
Subsidy	Enrolling in a particular contract means that you would receive a payment for adopting the practices. The payments would be paid annually per hectare enrolled.			

Choice card

Arable land

Assume that from 2018, current AES cease and farmers are offered to enter into new contracts…
From your previous answers we have learnt that on your farm there are X ha of arable land. Contracts that can be implemented on arable land include the following practices:

	Improved utilization of fertilizers	Crop diversification	Catch crops	No contract
Duration	5 years	2 years	10 years	
Termination	Possible without refund	Possible with refund	Possible without refund	
Subsidy	400 PLN/ha	200 PLN/ha	900 PLN/ha	
Your ranking from most (1) to least preferred (4)	☐	☐	☐	☐

Choice card
Peatland

From your previous answers we have learnt that on your farm there are X ha peatland. Contracts that can be implemented on peatland include the following practices:

	Basic peatland protection	Extended peatland protection	No contract
Duration	5 years	2 years	
Termination	Possible without refund	Possible with refund	
Subsidy	600 PLN/ha	800 PLN/ha	
Your ranking from most (1) to least preferred (4)	☐	☐	☐

Choice card
Meadows

From your previous answers we have learnt that on your farm there are X ha of meadows. Contracts that can be implemented on meadows include the following practices:

	Extensive mowing and grazing	No contract
Duration	5 years	
Termination	Possible with refund	
Subsidy	600 PLN/ha	
Your ranking from most (1) to least preferred (4)	☐	☐

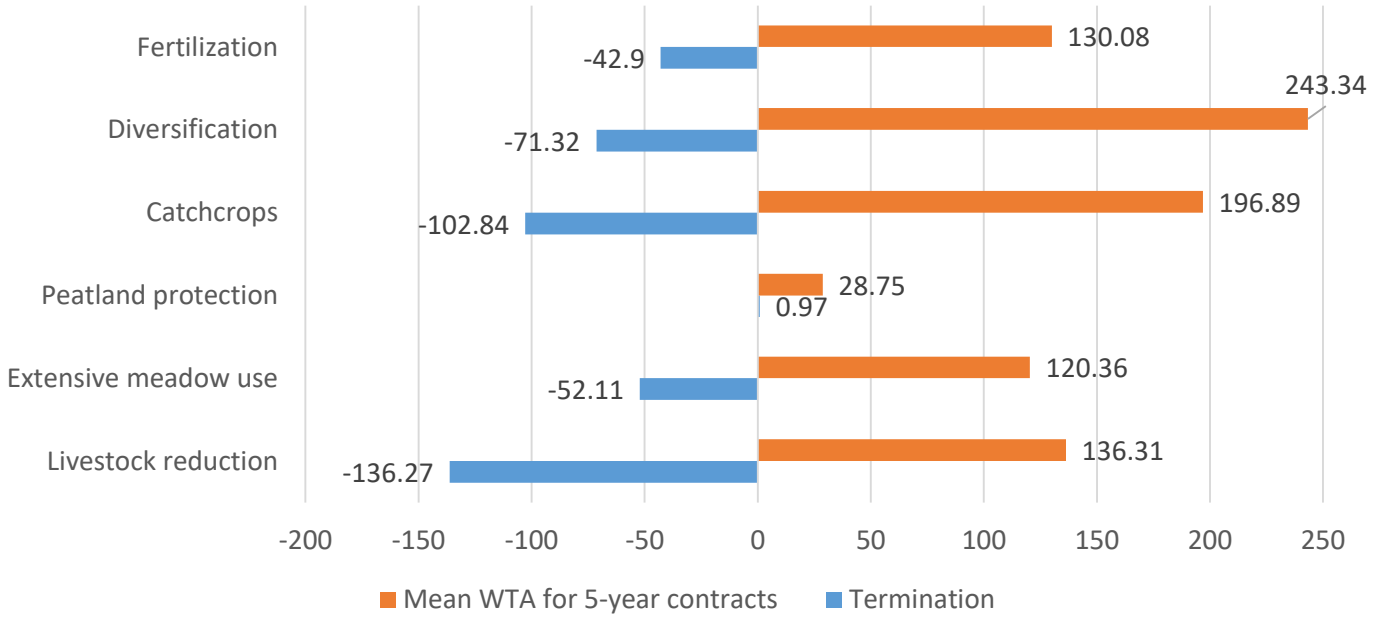
Choice card

Animal/Mixed production

From your previous answers we have learnt that on your farm there are around A livestock units (LSU), which means density of B LSU/hectare. Contracts that can therefore be proposed to your farm include the following:

	Reduction of livestock stocking density to 0.5 LSU/ha (by X LSY/ha)	Reduction of livestock stocking density to 1 LSU/ha (by X LSY/ha)	Reduction of livestock stocking density to 1.5 LSU/ha (by X LSY/ha)	No contract
Duration	5 years	2 years	10 years	
Termination	Possible without refund	Possible with refund	Possible without refund	
Subsidy	400 PLN/ha	200 PLN/ha	900 PLN/ha	
Your ranking from most (1) to least preferred (4)	☐	☐	☐	☐

Mean WTA for participation in AES
(in EUR per ha a year for a 5-year contract, RP-MXL)



- simultaneous analysis of multiple AES
- strong heterogeneity of preferences
- preferences for flexibility:
  - shorter contracts
  - option to cancel

Farm characteristics

	Main effects		Interactions									
	Mean	St. Dev.	Crop prod. (vs. mixed prod.)	Livestock prod. (vs. mixed prod.)	Arable land	Number of crops	Livestock / ha	Work force normalized	Farm with streams or rivers	Farm with areas subject to flooding	Share of land in Natura 2000 and National Park	Has participated agri-env schemes
Fertilization	-143.82***	181.10***	-55.52	-117.32***	1.76	27.78*	28.60	30.50**	26.49	82.67***	78.11	264.54***
Diversification	-124.66**	160.57***	6.24	-165.91***	-0.74	49.88***	45.68*	57.26***	70.66***	-66.76***	62.15	188.48***
Catch crops	-245.89***	146.52***	88.25**	-133.80***	-36.74**	13.15	128.97***	54.46***	98.82***	-0.96	-1.09	182.54***
Basic peatland	-139.13	79.10***	69.08	-230.98***	7.67	26.28	18.02	-5.56	135.69**	55.78	778.20***	30.49
Extended peatland	-356.34***	69.98***	130.56*	-136.95**	-4.72	-2.95	25.40	67.86**	211.45***	-12.50	365.45	27.38
Extensive meadow	-266.32***	213.53***	68.03**	-25.91	-80.63***	56.72***	-7.24	10.37	23.84	22.68	353.26***	203.62***
Livestock reduction	-156.05***	79.55***	-43.21	-17.78**	15.66***	-21.87***	-9.85***	-7.76***	18.78***	40.83***	42.39***	71.85***
Length	-6.27**	24.16***	-5.29**	-6.50***	4.06***	-2.45***	-0.34	2.17**	-7.18***	3.69**	14.61	-0.36
Possible to cancel	156.26***	113.62***	-16.46	-62.35***	26.02***	18.48***	36.92***	-15.35**	45.37***	-24.18*	199.54***	-24.42*

Knowledge, information treatments

1 Subjective knowledge

I know a lot about protected species of birds in the Biebrza Valley.
I know agricultural practices needed to protect these species of birds in the Biebrza Valley.

2 Objective knowledge

Please select a species name:

		
a) Pipit b) Lark c) <u>Aquatic warbler</u> d) I don't know	a) <u>Northern lapwing</u> b) White-winged tern c) Montagu's harrier d) I don't know	a) Black grouse b) <u>Ruff</u> c) Western capercaillie d) I don't know
		
a) Corn crake b) <u>Black-tailed godwit</u> c) Great snipe d) I don't know	a) <u>Eurasian curlew</u> b) Montagu's harrier c) Common snipe d) I don't know	a) <u>Eurasian wigeon</u> b) Common starling c) Greater white-fronted goose d) I don't know

3 Info treatments

- between-group, randomized
- factual information: why a specific agricultural practice is introduced and what are the benefits of it
- matched AES measures

Sources of pictures:

1. Aquatic warbler: http://ptaki.info/wodniczka
2. Northern lapwing: http://www.bird-watching.pl/picture.php?/3036/category/110 (Author: Marcin Łukawski)
3. Ruff: http://www.birdwatching.pl/galeria/ostatnio-dodane/zdjecie/37759 (Author: Tomasz Skorupka)
4. Black-tailed godwit: http://ptaki.info/imgekoprojekty/image/ptaki/komentarze/367.jpg (Author: Łukasz Talaga)
5. Eurasian curlew: http://www.birdwatching.pl/galeria/kategoria/191-kulik-wielki-numenius-arquata/zdjecie/52068 (Author: Adam R. Markowski)
6. Eurasian wigeon: https://ciechus.flog.pl/wpis/6805645/swistun (Author: Adrian Ciechanowski)

Information treatments

Arable land
– Rational use of fertilizers reduces inflow of nutrients, in particular nitrogen (N) and phosphorus (P) loading, to surface waters and groundwater. Thus, rational use of fertilizers improves quality of water used for drinking, open water swimming and recreation, and contributes to clean environment. – Crop diversification protects soil from loss of organic matter. Greater diversification is also beneficial to the local environment around the farm, as it improves conditions for other plants and animals. – Growing crops between successive plantings of a main crop reduces water pollution and the soil erosion. Catch crops prevent minerals being flushed away from the soil and protects water against nutrient pollution from fertilizers, in particular with nitrogen and phosphorus, plant protection products and of their residues, and other toxic substances. Catch crops contribute to plant diversification on the farm, so it also improves conditions for other plants and animals.
Peatland
Peatlands are a habitat of many species of plants and animals. Often, they are the last natural places where rare and endangered species occur. Peatland protection practices enable restoration of good ecological conditions, or at least prevent the land from worsening degradation. Such practices improve conditions for birds that have their habitats there.
Meadows
These practices support the existence of the meadows and pastures, a form of traditional rural landscape; they also improve conditions for endangered birds, whose nesting habitats occur in a permanent grassland; finally, they improve ecologic conditions of extremely valuable natural habitats on meadows and pastures.
Livestock / mixed crop-livestock production
Reduction of livestock stocking density improves quality of surface and groundwater, it also increases biodiversity on meadows and pastures.

Effects of knowledge/info

	Main effects					
	Mean	St. Dev.	Subjective bird knowledge normalized	Subjective AE practices for birds knowledge normalized	Number of birds recognized	Info treatment
Fertilization	-143.82***	181.10***	33.57*	-53.61***	0.00	-82.51***
Diversification	-124.66**	160.57***	4.85	-12.24	8.96	-50.47**
Catch crops	-245.89***	146.52***	23.37	-41.50**	23.59***	-52.85**
Basic peatland protection	-139.13	79.10***	23.65	-18.11	32.35***	-12.74
Extended peatland protection	-356.34***	69.98***	-6.97	-10.67	51.20***	29.54
Extensive meadow use	-266.32***	213.53***	-26.26**	32.98**	24.55***	6.14
Livestock reduction	-156.05***	79.55***	-1.36	13.90***	6.68***	-6.32
Length	-6.27**	24.16***	5.04***	2.93***	-3.54***	-0.88
Possible to cancel	156.26***	113.62***	-23.24***	11.41	-20.72***	-6.70

Results summary

- substantive differences in mean **willingness to accept** for 6 agri-environmental practices (as presented)
- strong **heterogeneity** of preferences
- **flexibility** preferred: shorter contracts, option to terminate
- simultaneous analysis of multiple agri-environmental schemes → effects of most explanatory variables depent on agricultural practice
- pre-test of information campaign: highlighting environmental benefits of AES is an insufficient incentive for farmers to enroll
- Kruger-Dunning effect observed (overconfidence?)
- positive effects of
  - experience in AES
  - knowledge – local bird species (objectively measured)

Thank you!

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References

1. Stokstad, E. Landmark analysis documents the alarming global decline of nature. doi:10.1126/science.aax9287 Available on-line: https://www.sciencemag.org/news/2019/05/landmark-analysis-documents-alarming-global-decline-nature (Access: May 6, 2019)
2. Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services: https://www.ipbes.net/news/Media-Release-Global-Assessment
3. Foley, J. A., DeFries, R., Asner, G. P., Barford, C., Bonan, G., Carpenter, S. R., Chapin, F. S., Coe, M. T., Daily, G. C., Gibbs, H. K., Helkowski, J. H., Holloway, T., Howard, E. A., Kucharik, C. J., Monfreda, C., Patz, J. A., Prentice, I. C., Ramankutty, N. and Snyder, P. K. (2005). Global consequences of land use. *Science (New York, N. Y.)* 309: 570–574.
4. Henle, K., Alard, D., Clitherow, J., Cobb, P., Firbank, L., Kull, T., McCracken, D., Moritz, R. F. A., Niemelä, J., Rebane, M., Wascher, D., Watt, A. and Young, J. (2008). Identifying and managing the conflicts between agriculture and biodiversity conservation in Europe – a review. *Agriculture, Ecosystems and Environment* 124: 60–71.
5. http://www.national-geographic.pl/aktualnosci/biebrza-symfonia-bagien