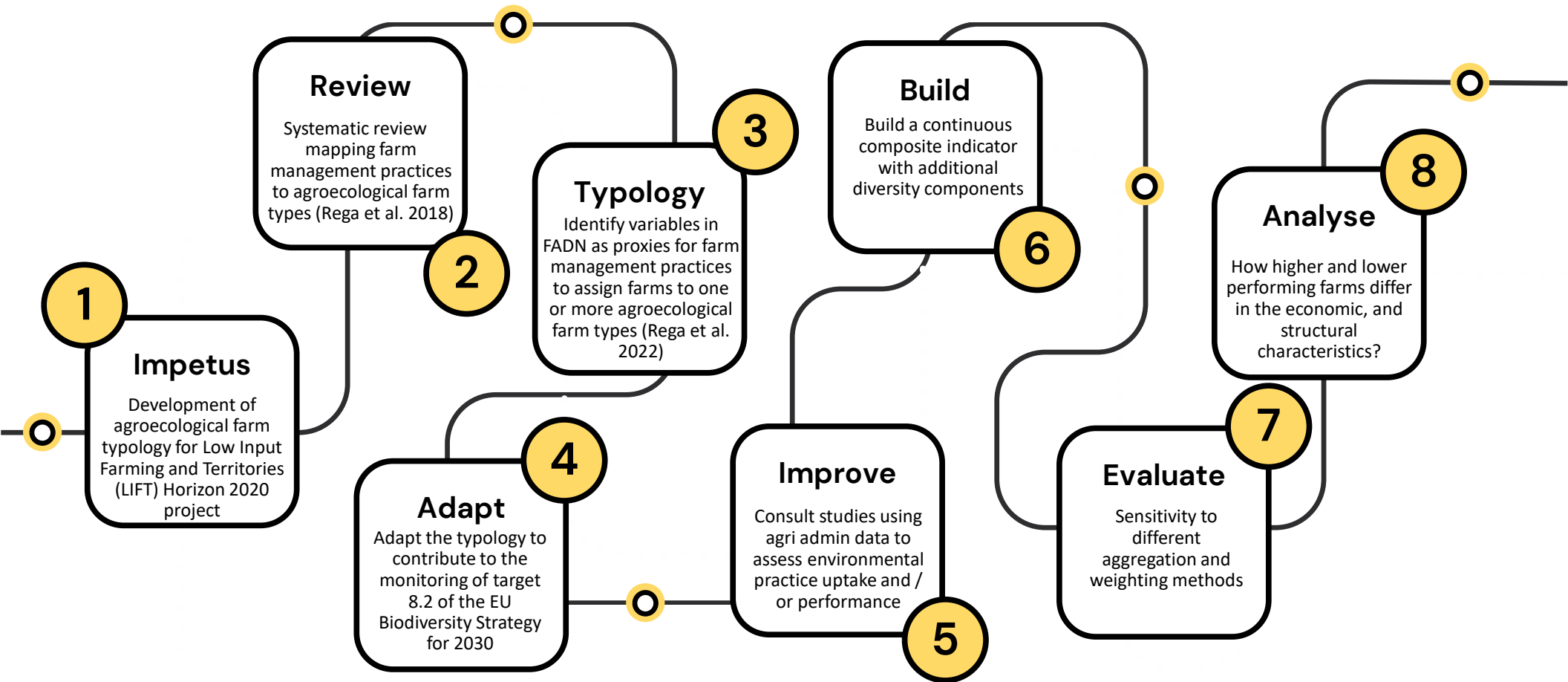


What can we understand about the prevalence of agroecological practices across the EU using FADN?

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Motivation



Purpose

- ✓ It is a **farm-level practice** indicator, which uses variables from the Farm Accountancy Data Network (FADN) as proxies for agroecological farm management practices.
- ✓ The purpose of the indicator is **not** to provide an assessment of farms environmental, economic or social performance. We believe it is useful to try to separate the what from the why - practices from outcomes.
- ✓ The indicator is distinguished by its:
 - ✓ suitability for **all farm types** and countries
 - ✓ robustness through **sensitivity analysis**
 - ✓ environmental / agroecological practice focus
- ✓ Having an indicator focussed only on farm practice proxies means we can then investigate how higher and lower performing farms differ in the economic, and structural characteristics

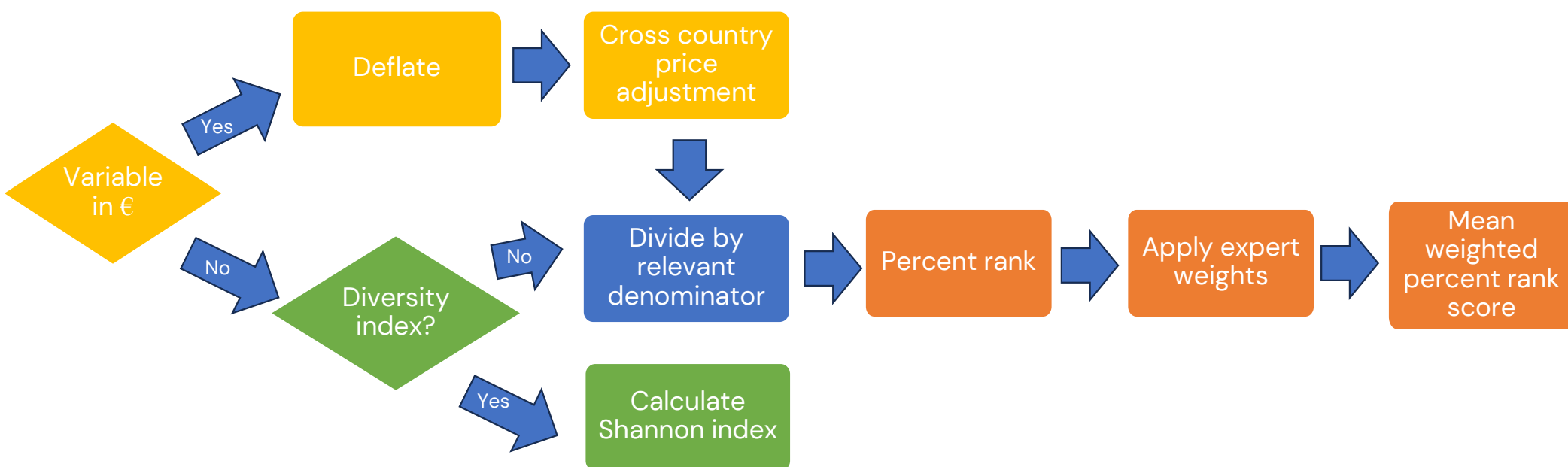
Methods

Which variables did we use?



Agroecological farming dimension represented	Livestock Farms	Non-Livestock Farms	FADN Variables
Reduced input intensity	Fertiliser (euro per ha)	Fertiliser (euro per ha)	SE295 / SE025
	Plant protection (euro per ha)	Plant protection (euro per ha)	SE300 / SE025
	Electricity (euro per ha)	Electricity (euro per ha)	IELE_V / SE025
	Fuel (euro per ha)	Fuel (euro per ha)	(IHFULS_V + IFULS_V) / SE025
	Machinery upkeep (euro per ha)	Machinery upkeep (euro per ha)	SE340 / SE025
	Seed (euro per ha)	Seed (euro per ha)	SE285 / SE025
	Livestock units per ha	NA	SE080 / SE025
Feed (euro per livestock unit)	NA	(SE310 + SE320) / SE080	
Circularity	Seed own ratio	Seed own ratio	SE290 / SE285
	Feed own ratio	NA	(SE315 + SE325) / (SE310 + SE320)
Soil Health	Crop diversity	Crop diversity	_TA record total area of different crop types grown. Used to create Shannon diversity index.
Biodiversity	Woodland to UAA ratio	Woodland to UAA ratio	SE075 / SE025
	NA	Uncropped to UAA ratio	SE074 / SE025
	Land use diversity	Land use diversity	_TA record total area of different crop types grown. Used to create Shannon diversity index.
	Rough grazing to UAA ratio	NA	SE080 / SE025

How did we create the selected indicator?



Secondary Analysis

- ✓ Using the indicator as the dependent variables, we explore a range of farm structural and contextual variables to understand patterns of variation in the score.
- ✓ We use a special case of a within-between model (mixed effects) model.
- ✓ This allows us to explore within-farm effects and address unobserved heterogeneity and omitted variable challenges as in the fixed effects model, while also considering parameter estimates for between-farm effects which are relevant from a policy perspective.
- ✓ The within / fixed effects part of the model accounts for both individual farm and time effects.

Results Highlights

Mean EU scores over time

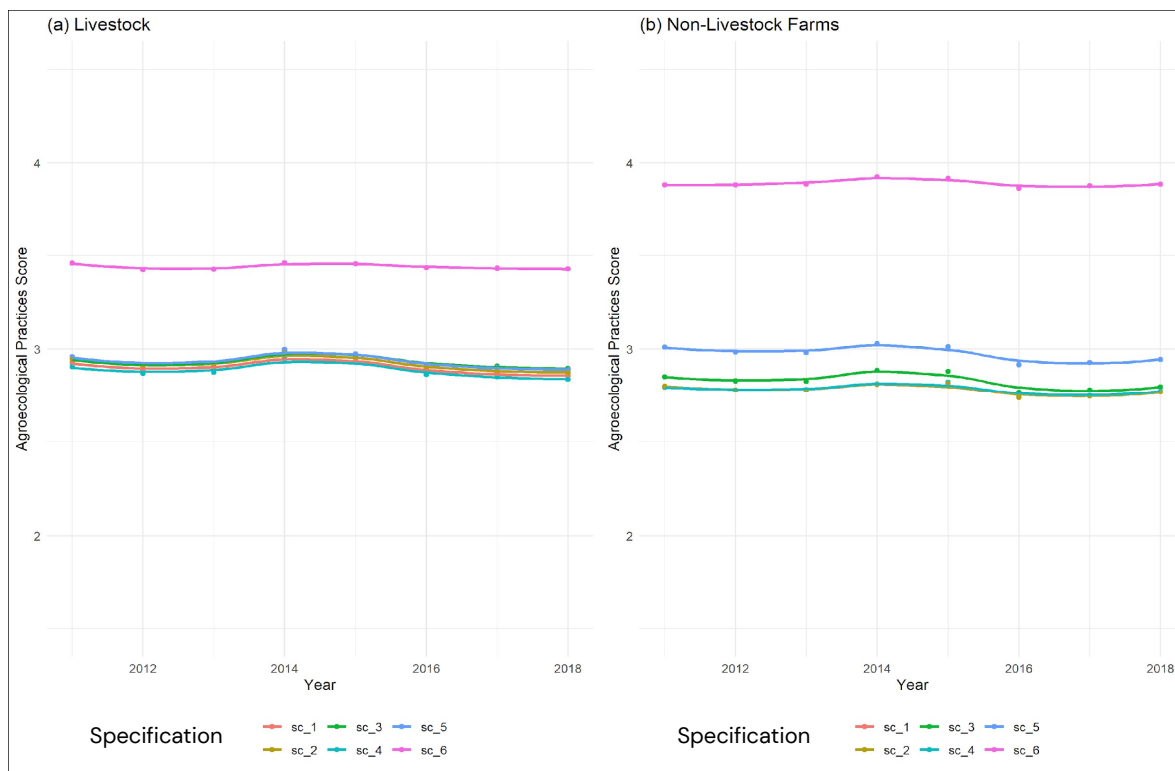


Figure 1 Mean agroecological score for farms by year for each specification using data 2011-2018 (a) for livestock farms (b) for non-livestock farms

Mean scores by farm type

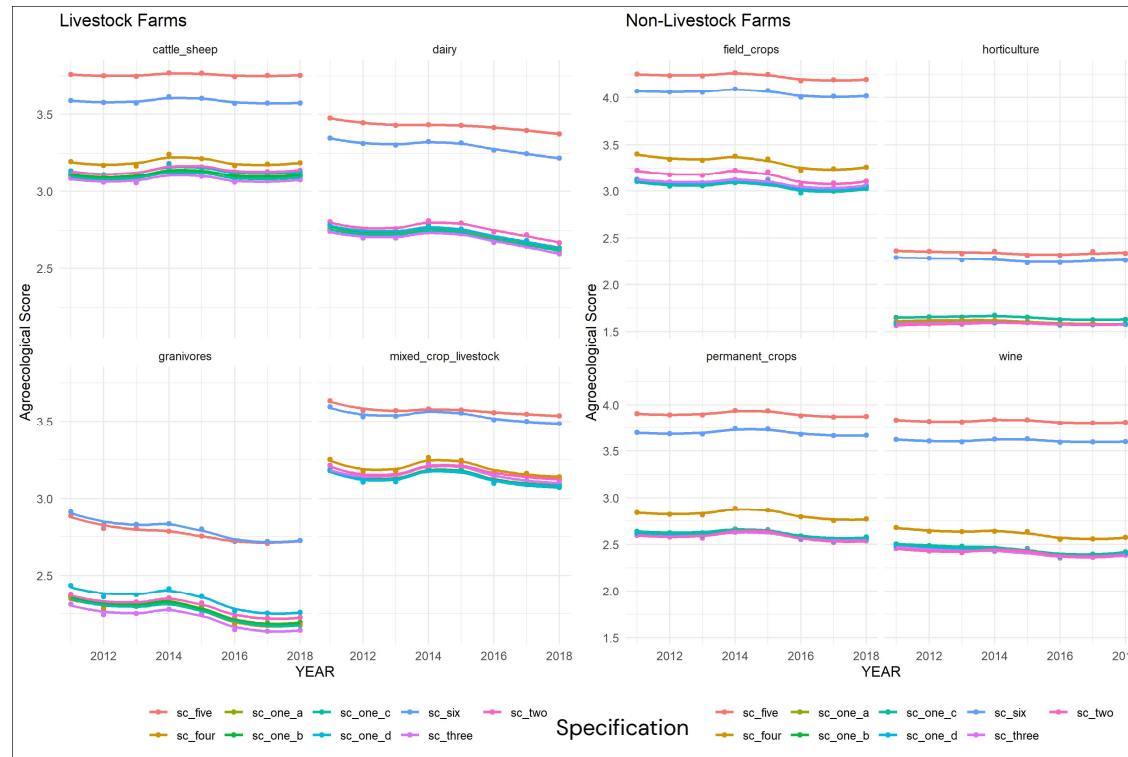


Figure 1 Mean agroecological score for farms by farm type and year for each specification using data 2011-2018 (a) for livestock farms (b) for non-livestock farms

Variation within farms

- ✓ The within part of the model looks at how things change (on average) within the same farm.
- ✓ Farms with higher agroecological scores are (on average) associated with being:
 - ✓ Economically smaller
 - ✓ Physically larger
 - ✓ Having a smaller share of rented land
 - ✓ Having less paid labour (livestock farms only)
 - ✓ Higher output / input ratio

Variation between farms



- ✓ The between part of the model looks at how things change on average between different farms.
- ✓ Farms with higher agroecological scores are on average associated with:
 - ✓ Being economically smaller
 - ✓ Being physically larger
 - ✓ Having a **smaller** share of rented land
 - ✓ **More likely to have environmental subsidies**
 - ✓ **More likely to be organic**
 - ✓ Having less paid labour (**non-livestock farms only**)
 - ✓ **Lower output / input ratio (livestock farms) but more profitable (non-livestock farms)**
 - ✓ **Lower return on assets (non-livestock only)**

Within / Between Results



Coeff Type	Variable	Livestock farms				Non-livestock farms			
		Coef.	Std. err.	p-value	Sig.	Coef.	Std. err.	p-value	Sig.
Within	Log economic size	-0.117	0.029	0.000	***	-0.147	0.015	0.000	***
Between	Log economic size	-0.125	0.032	0.000	***	-0.165	0.015	0.000	***
Within	Log UAA	0.183	0.010	0.000	***	0.389	0.022	0.000	***
Between	Log UAA	0.012	0.011	0.285	***	0.003	0.026	0.909	
Within	Extent of rented land	0.017	0.007	0.019	*	0.009	0.003	0.007	**
Between	Extent of rented land	-0.017	0.008	0.029	*	-0.032	0.004	0.000	***
Within	Environmental subsidies	0.013	0.024	0.575		0.000	0.011	0.973	
Between	Environmental subsidies	0.148	0.018	0.000	***	0.062	0.019	0.001	**
Within	Organic	0.042	0.028	0.133		0.034	0.037	0.359	
Between	Organic	0.177	0.033	0.000	***	0.169	0.037	0.000	***
Within	Paid labour	-0.009	0.004	0.013	*	-0.013	0.008	0.108	
Between	Paid labour	-0.007	0.006	0.196		-0.051	0.014	0.000	***
Within	Output / input	0.128	0.048	0.008	**	0.071	0.016	0.000	***
Between	Output / input	-0.116	0.025	0.000	***	0.057	0.013	0.000	***
Within	Return on assets	-0.016	0.060	0.795		-0.018	0.025	0.463	
Between	Return on assets	-0.012	0.062	0.852		-0.322	0.051	0.000	***

Notes

- Output / input (excluding subsidies) = total output / inputs = SE131 / SE275 + SE360 + SE370 + SE375 + IINT_V
- Return on assets = average investment value / farm net income = mean (SE436 + SE437) / SE420

Additional Observations

- ✓ Bioregion is important for agroecological scores of livestock but not non-livestock farms.
- ✓ Sheep/Beef and Mixed Crop Livestock farms tend to score higher than Dairy or Granivores
- ✓ Field Crops and Wine farms tend to score higher than Horticulture or Other Permanent Crops
- ✓ Variation between countries was also notable.

Conclusion

- ✓ We have proposed a composite indicator to measure the degree to which the management of a farm is aligned with the identified agroecological dimensions.
- ✓ Operationalised on FADN data, we believe this indicator is helpful to monitor the shift towards ecological farming over time in EU agriculture and thus to be used as indicator to monitor the uptake of agroecological practices as required by EU BDS Target 8.
- ✓ Overall agroecological scores have remained somewhat constant over the period of study, meaning that no progress towards target is visible.
- ✓ We have some positive glimmers, for example within farms, higher scores are associated with higher profits, so some farms do find a path through.

Next Steps and Applications



- ✓ Ideally, we would measure farm practices – instead, we are using proxies for the practices. We would also separately measure farm GHG / Nitrogen use performance.
- ✓ To better understand the uptake of practices we need to measure practices and not continue to use proxies, otherwise it will remain difficult to understand at scale how to advise farmers.

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The opinions expressed in the paper are those of the authors only and cannot be considered under any circumstances as an official position of the European Commission.

Composite Indicator Specifications



- 1) Percent rank method with equal weights.
- 2) Percent rank method with equal weights, farms with 0 UAA removed from calculations.
- 3) Percent rank method with expert weights (weighting adapted from Rega et al. 2022).
- 4) Percent rank method with equal weights, no CPPI adjustment.
- 5) Percent rank method with equal weights, same variables as indicated by PCA.
- 6) PCA method with PCA weights, z-score normalised indicators.