



Diversity of agri-environmental governance and potential impacts on environmental performance – a systematic review

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ABSTRACT

The governance of Agri-Environmental Schemes (AES) in the European Union plays a crucial role in shaping their environmental performance. However, existing research remains fragmented across different governance models and geographical contexts. This paper provides a systematic literature review of 28 studies to consolidate evidence on AES governance. It examines how governance models - through AES design, implementation, and actor interactions - are shaped and how related factors affect AES environmental performance.

Our findings highlight the diversity of AES governance models, ranging from centralized national approaches to highly decentralized regional systems. The degree of decentralization, multi-level decision-making processes, and the engagement of different actors emerge as key determinants of AES governance models. The review further underscores a fundamental tension between centralization and decentralization, where increased subsidiarity enhances local relevance but may lead to policy fragmentation and objective dilution. Additionally, we identify three primary governance-related factors influencing AES environmental performance: design-related (e.g., contract features and spatial targeting), actor-related (e.g., power dynamics and stakeholder participation), and implementation-related (e.g., monitoring challenges and transaction costs). Furthermore, the results underline the role of path dependency, as past relationships among key practitioners continue to shape policy dynamics and define the mandates of the various actors involved.

This study concludes that while governance does not directly determine AES environmental performance, it shapes the context for success or failure by influencing actor dynamics, policy design, and implementation strategies. Effective governance requires balancing subsidiarity with policy coherence, shaping decision-making processes, and addressing actors' inclusion that may allow higher environmental performance.

1. Introduction

The governance of Agri-Environmental Schemes (AES) in the EU has been a research topic over more than the past two decades within the broader literature on AES (Batáry et al., 2015; Kleijn et al., 2006; Matzdorf and Lorenz, 2010; Primdahl et al., 2003, 2010; Schulze et al., 2023; Whittingham, 2011; Uthes and Matzdorf, 2013; Lowe and Baldock, 2000; Buller et al., 2017). The AES literature has been largely dominated by ecological and economic perspectives in addressing the challenges within agri-environmental programming in achieving its environmental objectives. However, emerging studies focused on governance-related factors underline their key role in shaping the AES's environmental performance, defined as the extent to which the environmental objectives of an AES can best be achieved (Schomers and Matzdorf, 2013; Uthes and Matzdorf, 2013). The AES governance

literature converges on several common elements characterizing the concept of governance: a clear goal or priority to be achieved, a plurality of actors from both public and private entities, dynamic interactions among these actors (Beckmann et al., 2009; Westerink et al., 2017; Bazzan et al., 2023; Sattler et al., 2023), and the presence of institutions, rules, and institutional arrangements that shape these interactions (Meyer et al., 2015; Lien et al., 2018; Bazzan et al., 2023). Consistent with the multi-level governance framework prevalent in EU public policy studies (Hooghe and Marks, 2010; Jordan, 2001; Hooghe and Marks, 2010; Bache et al., 2016), AES governance research also underlines that decision-making occurs at various levels, affecting both the design features (e.g. spatial targeting, payment structure, duration of contracts) (Bazzan et al., 2023) and the overall governance structure (Beckmann et al., 2009).

Yet, the evidence generated by AES governance literature is often

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fragmented across different geographical contexts, reflecting the diversity of governance models implemented across EU Member States (Beckmann et al., 2009; Sattler et al., 2023; Schomers et al., 2015). AES serve as a policy instrument with specific design features that involve a particular group of actors, while also acting as a farm-level measure that is defined by how it is implemented and put into practice. Under the principle of subsidiarity that governs the second pillar of the Common Agricultural Policy (CAP) in which AES are included, AES design, implementation, and actor interactions vary significantly across the EU. These variations lead to distinct adaptations of the EU policy framework, under different governance models, within each Member State and even at sub-national regional and local levels (Beckmann et al., 2009; Mazorra, 2001; Zwaan et al., 2023). Consequently, the governance models linking policy and farm-level implementation differ widely across the EU.

Several literature reviews have addressed key themes related to AES, mainly focusing on farmer preferences and behavioral determinants in the adoption of AES (Klebl et al., 2023; Schaub et al., 2023; Schulze et al., 2023), but also contractual features (Olivieri et al., 2021). Among these, the review conducted by Uthes & Matzdorf (2013) serves as a key reference, offering an overview of research topics, major findings, and future challenges associated with AES. Their study highlights governance and institutional environments as critical factors influencing AES

environmental performance, calling for higher relevance and empirical implications of AES literature for decision-making processes occurring at both policy and farm level. Despite the initial insights provided by Uthes & Matzdorf (2013), the evidence from AES governance literature remains fragmented, and navigating through the multitude of studies on AES governance remains challenging. To date, no comprehensive review has systematically synthesized the available evidence on this research topic.

Against this background, the present research aims for a comprehensive overview of the fragmented AES governance literature, drawing further insights on the research topic by systematically consolidating evidence on governance models in different EU Member States. By examining the features of the AES governance models, through AES design, implementation, and actor interactions, this review highlights the diversity of governance approaches and their implications for their environmental performance. In doing so, it enhances the empirical and policy relevance of AES governance research, facilitating a more coherent understanding for both scholars and practitioners.

For this, we address the following research questions.

1. What characterizes AES governance models (i.e., AES design, implementation, and actor interactions) in different EU Member States?

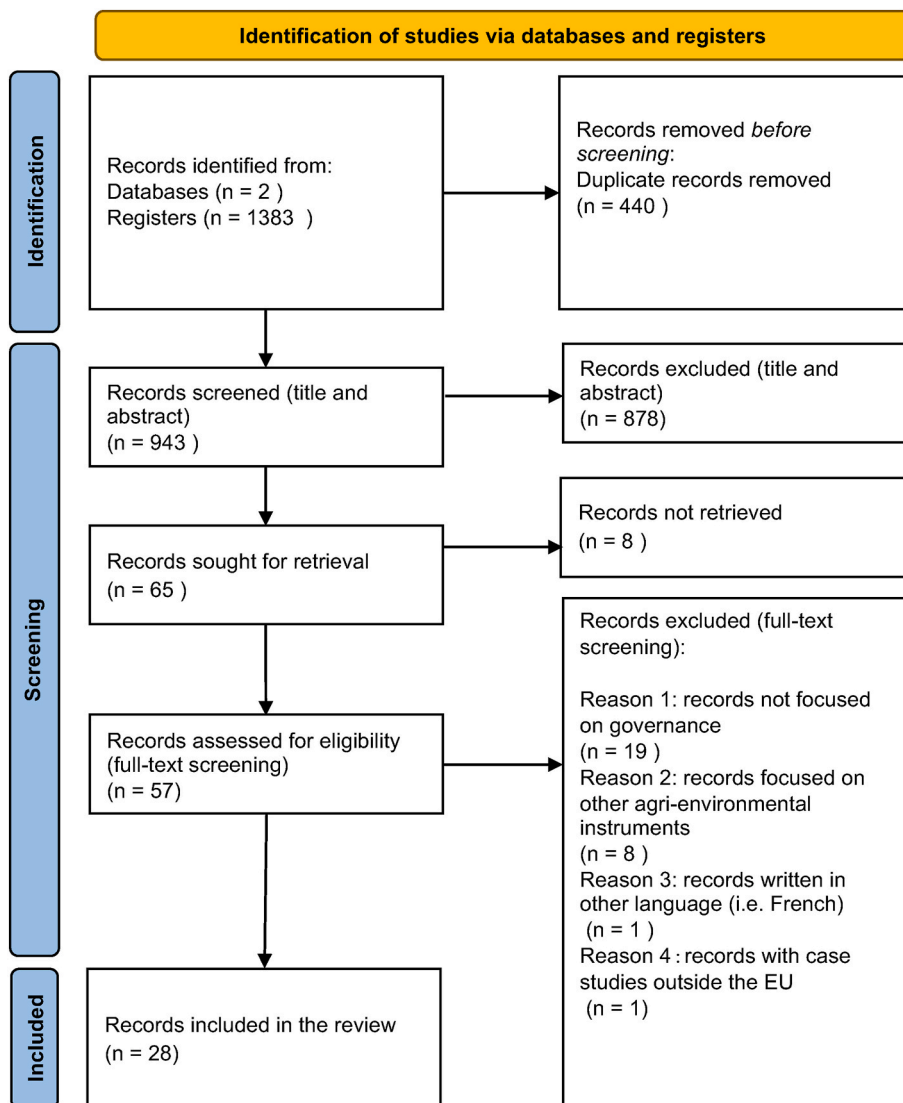


Fig. 1. Identification, screening, and inclusion process of relevant studies. Source Authors' compilation, based on the PRISMA 2020 flow diagram.

2. What does the literature reveal about the linkage between AES governance features and AES environmental performance?

The paper is structured as follows: Section 2 outlines the methodological framework of the study; Section 3 presents the results, addressing each research question separately; Section 4 discusses the findings, synthesizing insights from both research questions and reflecting on overall AES governance; and Section 5 concludes with key recommendations and final remarks.

2. Methodology

This study employed a systematic literature review guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement (Page et al., 2021). The PRISMA framework was selected for its robustness and replicability, providing a transparent approach to identifying, selecting, and synthesizing relevant studies (Fig. 1). The review was conducted using two major bibliographic databases, Scopus and the Web of Science Core Collection, which offer extensive coverage of peer-reviewed publications. Both databases index a broad spectrum of scholarly outputs, including journal articles, conference proceedings, books and book chapters, editorials, and review papers, as well as other scientific and technical documents across diverse disciplines, ensuring comprehensive coverage of relevant literature.

2.1. Search terms

Search terms were categorized into four thematic areas, as presented in Table 1, with the design of the search strategy drawing inspiration from Klebl et al. (2023). The search strategy aimed to retrieve articles based on three main thematic areas, derived from the research boundaries set by the two research questions: i) the policy instrument (i.e. the agri-environmental schemes), ii) the policy framework (i.e. the Common Agricultural Policy) and iii) the research topic (i.e. governance). We did not include references to specific Member States, as agri-environmental schemes and the CAP inherently encompass the geographical scope (i.e., the EU and its related MS). In other words, we selected articles based on their references to agri-environmental schemes, excluding those that focused solely on geographical context without discussing these schemes.

For the first two categories, we included various synonyms and alternative spellings or acronyms. To address governance-related aspects, we relied on the authors' knowledge of pertinent literature. We selected a few key references to extract frequently recurring terminology used to refer to "governance," which informed the "research topic" category in Table 1. The timespan focused on publications from 1992 to 2024, reflecting the beginning of AES implementation under the MacSharry reform across Member States. Environmental performance was not explicitly targeted through keyword selection but was addressed through the coding process during the analysis phase. This strategy, while excluding some articles, reduced noise in the dataset, ensuring a focus on the core literature relevant to the study's objectives. The research design is grounded in the assumption that, for our study, AES governance literature includes elements of AES environmental

performance literature. Still, the latter do not always explore elements of AES governance. This assumption ensures the targeting of articles where a direct link between AES governance and AES environmental performance is explored. Including all AES environmental performance studies would result in a broader and less targeted literature set, potentially diluting this focus.

2.2. Article screening and selection

The review process involved three main phases: i) title screening, ii) abstract screening, and iii) full-text screening (Supplementary Materials – Annex 1). We firstly remove all duplicates, then screened titles, excluding articles outside the geographical scope of EU and not written in English. During the abstract screening phase, two reviewers independently evaluated the abstracts against the predefined inclusion criteria in Table 2.

When uncertainty arose, an inclusive approach was adopted, including articles for further review. Following the abstract screening, the reviewers met twice to resolve divergent scoring and finalise the selection of articles. The full-text screening phase, conducted solely by the first author, involved a full-length screening of the articles to identify those meeting all inclusion criteria. A few articles were not retrieved and, therefore, were excluded from the review. Reasons for exclusion were systematically documented, and four primary exclusion categories were identified, as summarized in Fig. 1. Full-text screening focused primarily on the results and discussion sections, selecting papers that provided detailed insights into the functioning of governance models. Specifically, we included studies that offered an in-depth understanding of the processes linking actors and their mandates across the design and implementation phases of AES governance.

Papers were excluded if they lacked granular information on governance models, treating governance only as a contextual element or referencing it without detailing its functioning. Additionally, some papers were excluded during the title and abstract screening as their focus, while appearing relevant to AES, ultimately addressed subsidy frameworks beyond the scope of this research. One paper was excluded due to its full text being in French, despite an English abstract, and another was excluded after the full text revealed a geographical focus outside the EU, which was not clearly stated in the abstract.

2.3. Coding phase

A comprehensive coding process was carried out using NVivo software to analyse the selected articles. The coding architecture provided in the Supplementary Materials – Annex 2 primarily involved retrieving information under i) *case attributes* and ii) *qualitative codes*.

Case attributes captured quantitative metadata for each article, including publication year, methodology, and study location. These attributes were assigned based on a full-text review but were not linked to specific sections of the articles. They provided descriptive statistics and facilitated comparative analyses across studies and geographical contexts, informing the results presented in Section 3.1.

Qualitative codes identified key concepts relevant to the research questions, specifically AES governance models across Member States and the relationship between governance factors and AES environmental performance. Governance-related codes grouped information on (i) key actors, (ii) governance features associated with different models, and (iii) references to the multi-level nature of governance. We identified these three thematic areas through an iterative process, observing that information on governance models in the reviewed articles consistently clustered around these themes. This alignment reflects both the characteristics of the policy framework, and the design and implementation feature intrinsic to the AES policy instrument. Given that AES is grounded in the subsidiarity principle, it entails multiple levels of decision-making streams (i.e. different processes of evaluating options and making choices to achieve goals), flexibility in implementation

Table 1
Search terms organized per category.

Policy instrument	(agri-environment* OR agrienvironment* OR agri-climate-environment* OR aecm*) AND (measure* OR scheme* OR program* OR programme*)
Policy framework	AND (CAP OR "common agricultural policy" OR policy)
Research topic	AND (governance OR institution* OR multilevel OR multi-level OR sub-national OR region* OR admin* OR meso* OR meso-level OR intermedia* OR subnational OR subsystem OR sub-system))
Time span	AND PUBYEAR >1992 AND PUBYEAR <2025

Table 2
List of inclusion criteria at abstract screening.

Inclusion criteria
1 Focused on governance & implementation of AES
2 Focus on AES predominantly, even if using other subsidy schemes as comparison
3 Peer-reviewed papers
4 In EU and MS
5 Timespan of the policy framework and instrument (from 1992 to 2024)
6 Written in English

across Member States, and the involvement of different actors depending on the geographical context.

For the link between governance factors and environmental performance, codes were categorized based on recurring arguments across the articles.

The coding strategy was developed and implemented in three phases. In the first, ex-ante phase, the coding architecture was jointly designed, discussed, and validated by both authors to ensure alignment with the research questions and to incorporate closed or clearly operationalized categories, thereby reducing the risk of interpretation bias. In the second phase, the first author conducted the coding for both case attributes and qualitative codes. In the third, ex-post phase, all ambiguous cases were flagged and jointly reviewed during monthly meetings to ensure consistency and robustness in the interpretation.

The result section provides insights from descriptive statistics derived from case attributes (i.e. Section 3.1), an analysis of governance models and related features aligning with the first research question (i.e. Section 3.2) and an overview of the insights provided by selected articles on the link between governance factors and AES environmental performance, aligning with the second research question (i.e. Section 3.3).

3. Results

3.1. An overview of the selected studies

The databases retrieved under Scopus and Web of Science were merged, resulting in 1383 records. We retrieved and eliminated 440 duplicates, resulting in 943 that passed the screening phase of the PRISMA method. The remaining 943 records comprised a variety of research outputs, predominantly journal articles ($n = 810$), followed by review papers ($n = 51$), book chapters ($n = 20$), and conference papers ($n = 29$). While reviewing the title and abstract of these records, we excluded 878 for lack of relevance with the target of this review on AES governance and included 65 for full-text screening. Eventually, only 57 records were retrieved, and the last phase of full-text screening allowed the selection of 28 in the review (Fig. 1 and Annex 1, Supplementary Materials).

The 28 articles, including 27 journal articles and one review paper, were published from 1999 to 2023 (Fig. 2), with some years having no publication, like 2000, and a window from 2002 to 2007.

All selected articles adopted a case study approach, ranging from 15 different Member States. As shown in Fig. 3, the Netherlands, with 12 cases, is highly represented, reflecting its pioneering role in AES development, having initiated these schemes in the 1980s (Dupraz and Guyomard, 2019). With Germany (9 cases), United Kingdom and Ireland (4 cases), northern EU countries are overrepresented, while studies focusing on southern and eastern EU sub-national regions are less frequent.

The reviewed papers are evenly divided between studies using single-case and multiple-case designs, showcasing heterogeneity in both categories. The case studies range from national to regional focus, with multiple case studies comparing regions or Member States (MS) across the EU (Table 3).

Of the studies reviewed, 15 focus on regional case studies within specific MSs, eight employ multiple-case designs, and seven focus on single cases (Table 3). This emphasis on the regional scale aligns with the subsidiarity principle governing the AES policy framework, which allows delegating significant decision-making authority to regional levels.

The methodologies adopted in the selected articles include qualitative, quantitative, and mixed methods, with a notable dominance of qualitative approaches (for specific information on methods see Tables 4 and 5, providing all information retrieved during the case attribute coding phase). Among the 28 studies reviewed, 18 employed qualitative methodologies, 9 utilized mixed methods, and only 1 relied exclusively on quantitative methods. Data sources also varied significantly: seven studies used semi-structured interviews, two conducted desktop research, and two implemented surveys. The remaining 17 studies combined multiple data sources, often integrating above mentioned data types, relying on both primary and secondary data. Regarding the types of AES analysed, 17 studies focused on action-based AES contracts (i.e., payments for adopting specific practices, regardless of outcomes), while 4 examined collective-based AES (i.e., agreements requiring group coordination for landscape-scale benefits), predominantly in the Netherlands (3) and Ireland (1). Additionally, 3 studies explored multiple contract types, and 4 did not specify the contract types included in their analysis.

3.2. A diversity of AES governance models across EU member states

The next four sub-sections provide insights into the analysis of the qualitative codes, exploring the first research question on AES governance models in different EU Member States. To do so, we explore: i) the multi-level framework characterizing the AES governance, along with

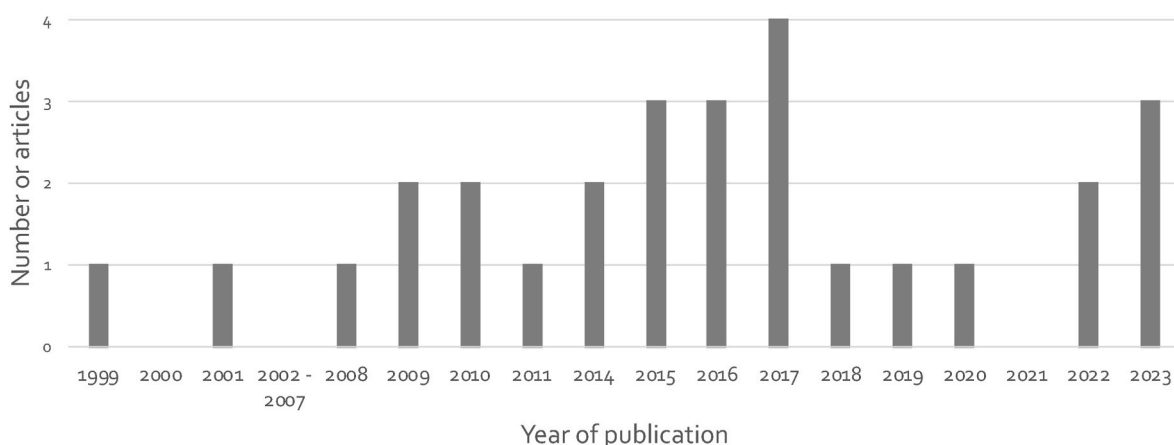


Fig. 2. Frequency per year of publication of the selected articles.

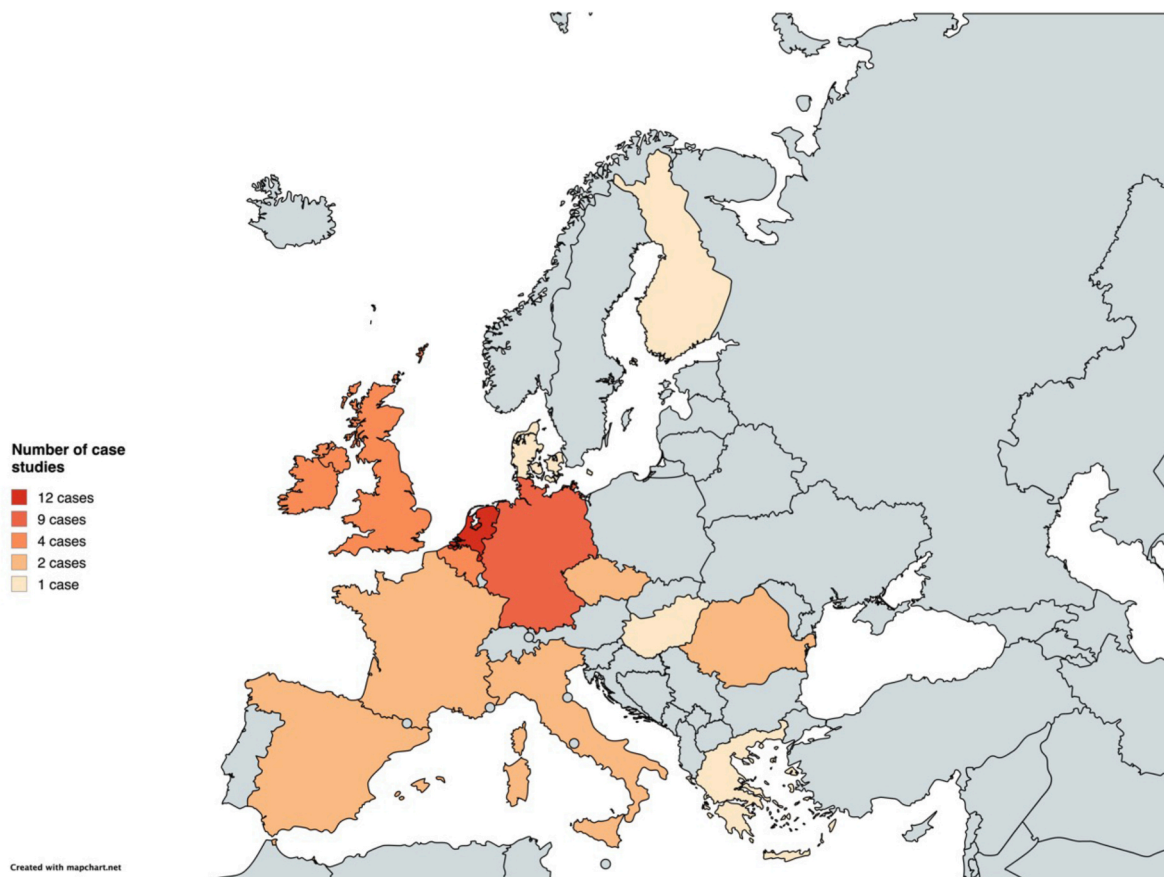


Fig. 3. Geographical distribution of the case studies in the selected articles (created with MapChart).

Table 3
Count of papers per geographical scope (i.e. EU vs MS) & type of case study approach (i.e. multiple case studies vs single case study).

Geographical reach	EU		MS		Total
	National	Regional	National	Regional	
Multiple case studies	3	3	N/A	8	14
Single case study	N/A	N/A	7	7	14
Total	3	3	7	15	28

different degrees of centralization, ii) different governance arrangements, and iii) interactions across AES governance actors (Fig. 4).

3.2.1. Decentralization & multi-level governance

The AES governance in the EU operates within a recognized multi-level governance framework (Beckmann et al., 2009; McCarthy et al., 2018; Mettepenningen et al., 2013). In the review, we identified 18 studies explicitly mentioning governance levels, and the multi-level nature of AES governance. A key element for the multi-level governance of AES is the degree of (de)centralization in their design and implementation across MS, with decision-making responsibilities distributed among local, regional, and national levels (Beckmann et al., 2009; Mazorra, 2001; Sattler et al., 2023; Schomers et al., 2015; Zwaan and Goverde, 2010). While the multi-level framework structures AES governance by defining distinct governance levels, (de)centralization determines the distribution of decision-making mandate across these levels, shaping both design and implementation. The subsidiarity principle is key in the AES multi-level governance model guiding agri-environmental policies across the EU. Under such principle, the EU establishes general policy guidelines through Council and Commission regulations, creating a framework for MS decision-making (Beckmann

et al., 2009). Member States then determine whether to delegate responsibilities to lower levels of government, such as regional or local authorities, for developing AES. The EU encourages decentralized policy design (Benoit and Patsias, 2017), a stance reflected in AES funding structures where the EU co-financing the budget. At the same time, MS or regions decide on program specifics and cover the remaining costs (Beckmann et al., 2009).

Member States have responded differently to this flexibility (Table 6), resulting in varied governance models ranging from centralized national approaches to more decentralized one governing AES (Beckmann et al., 2009). However, drawing a strict line between centralized and decentralized models is difficult, as Member States often combine elements of both, and in some cases explicitly adopt mixed governance features. As Runhaar et al. (2017) points out governance models may even evolve over time, with centralized systems progressively delegating responsibilities and moving towards more decentralized structures. The degree of centralization is discussed in each paper according to the specificity of each case study, yet some elements reoccur across the studies.

A first one is the responsibility cascade: in decentralized models, regional or provincial governments often receive the mandate for AES implementation and further delegate operational tasks, such as subsidy allocation or the designation of targeted areas, to local entities (Alblas and van Zeben, 2023; Bazzan et al., 2023; Benoit and Patsias, 2017; de Vries et al., 2019; Mazorra, 2001; Prazan and Theesfeld, 2014). In contrast, centralized systems tend to keep responsibilities at the national level (Lenihan and Brasier, 2009). In both cases, however, the cascade from the EU to the Member State is a constant feature of the CAP framework and the subsidiarity principle governing it (Beckmann et al., 2009; Bethwell et al., 2022).

A second reoccurring element is the role of collective dynamics,

Table 4List of selected studies and related meta-data information retrieved from case attributes coding phase – *single case study*.

Location of the study	Location of the study - specific	Authorship	Year	AES type	Period under study	Data type	Methodology	Methodology - specific
National	Czech Republic	Prazan & Theesfeld	2014	Means-based (Grassland measures)	2009–2011	Semi-directed interviews	Qualitative	Not specified
	Germany	Schomers et al.	2015	Means-based	2011–2012	Mixed	Qualitative	Not specified
	Ireland	McCarthy et al.	2018	Collective	2000–2016	Desktop research	Mixed	Process tracing
	Spain	Mazorra	2001	Means-based	1994–2001	Mixed	Mixed	Not specified
	The Netherlands	Alblas et al.	2023	Collective	2016–2022	Mixed	Qualitative	Applied Thematic Analysis
Regional	The Netherlands	Smits et al.	2008	Not specified	Not specified	Desktop research	Qualitative	New institutional-economics
	United Kingdom	Hejnowicz et al.	2016	Means-based	CAP 2007–2013	Survey	Mixed	Not specified
	Belgium	Dedeurwaerdere et al.	2015	Means-based	CAP 2007–2013	Mixed	Mixed	Thematic analysis, bi-probit model
	Germany	Hirsch et al.	2022	Means-based	2015–2020	Mixed	Qualitative	Content analysis
	Germany	Weber	2014	Means-based	2011	Semi-directed interviews	Qualitative	Coding
	Ireland	Lenihan & Brasier	2009	Means-based	200–2006	Mixed	Qualitative	Discourse analysis, coding
	The Netherlands	Bazzan et al.	2023	Collective	CAP 2014–2020	Semi-directed interviews	Qualitative	Theory-building or inductive process tracing
	The Netherlands	De Vries et al.	2019	Collective	Multiple	Mixed	Qualitative	Coding
	The Netherlands	Zwaan & Goverde	2010	Green Services	2001–2009	Mixed	Qualitative	Not specified

Table 5List of selected studies and related meta-data information retrieved from case attributes coding phase – *multiple case studies*.

Location of the study	Location of the study - specific	Authorship	Year	AES type	Period	Data type	Methodology	Methodology - specific
EU	France, Germany, Ireland, The Netherlands, United Kingdom, Belgium,	Sattler et al.	2023	Result-based, collective, land tenure, value chain	Not specified	Survey & desktop research	Mixed	Not specified
	Austria, Denmark, Greece, Romania, The Netherlands	Vesterager et al.	2016	Means-based	1994–2013	Mixed	Qualitative	Not specified
EU & Regional	Germany, Spain	Wilson et al.	1999	Means-based	1993–1996	Mixed	Mixed	Not specified
	Belgium, Czech Republic, Finland, France, Germany, Ireland, Italy, The Netherlands, United Kingdom	Beckmann et al.	2009	Not specified	2006	Survey	Quantitative	Regression analysis
	Austria, Germany, The Netherlands,	Bethwell et al.	2022	Mixed	CAP 2014–2020?	Mixed	Qualitative	Not specified
	Belgium, France, Germany, The Netherlands, United Kingdom,	Westerink et al.	2017	Means-based, collective	1996–2016	Semi-directed interviews	Mixed	Qualitative comparative analysis
Regional	France	Benoit & Patsias	2017	Means-based	CAP 2007–2013	Semi-directed interviews	Qualitative	Coding
	The Netherlands	Franks	2010	Not specified	Not Applicable	Mixed	Qualitative	Not specified
	Germany	Hauck et al.	2016	Not specified	CAP 2014–2020	Semi-directed interviews	Mixed	Social Network Analysis
	Hungary	Kovács	2015	Means-based	2011–2014	Mixed	Qualitative	Not specified
	Romania	Manolache et al.	2020	Means-based	CAP 2014–2020	Mixed	Mixed	Social Network Analysis
	The Netherlands	Runhaar et al.	2017	Means-based, collective	2000–2016	Mixed	Qualitative	Not specified
	Italy	Toderi et al.	2017	Means-based	CAP 2007–2013	Semi-directed interviews	Qualitative	SLIM diagnostic framework
Belgium	Van Herzele et al.	2011	Means-based	2008	Mixed	Qualitative	Not specified	

specifically in decentralized models in shaping the AES implementation. While most studies focus on farmers' collectives, and their role in the AES governance (Alblas and van Zeven, 2023; Bazzan et al., 2023; Manolache et al., 2020), the reviewed studies mention other collective forms of decision-making, involving for example local authorities, civil society actors or farmer advisors (de Vries et al., 2019; Manolache et al., 2020; Sattler et al., 2023).

A third recurring element is the delegation of technical advice to farmers, which is frequently entrusted to local actors or authorities. This occurs in both centralized (Lenihan and Brasier, 2009) and

decentralized models (Hejnowicz et al., 2016; Prazan and Theesfeld, 2014; Van Herzele et al., 2011). By contrast, strategic responsibilities remain consistently with the Ministry of Agriculture and its departments, also in both decentralized and centralized models.

Taking the entry point of Member States, Beckmann et al. (2009) define France as a more decentralized model and Ireland maintaining a highly centralized system. Benoit & Patsias (2017) tends to partially disagree, and points out that France has had a traditionally centralized model, and only during the CAP programming period 2007–2013 has delegated key responsibilities to regional level governments and has

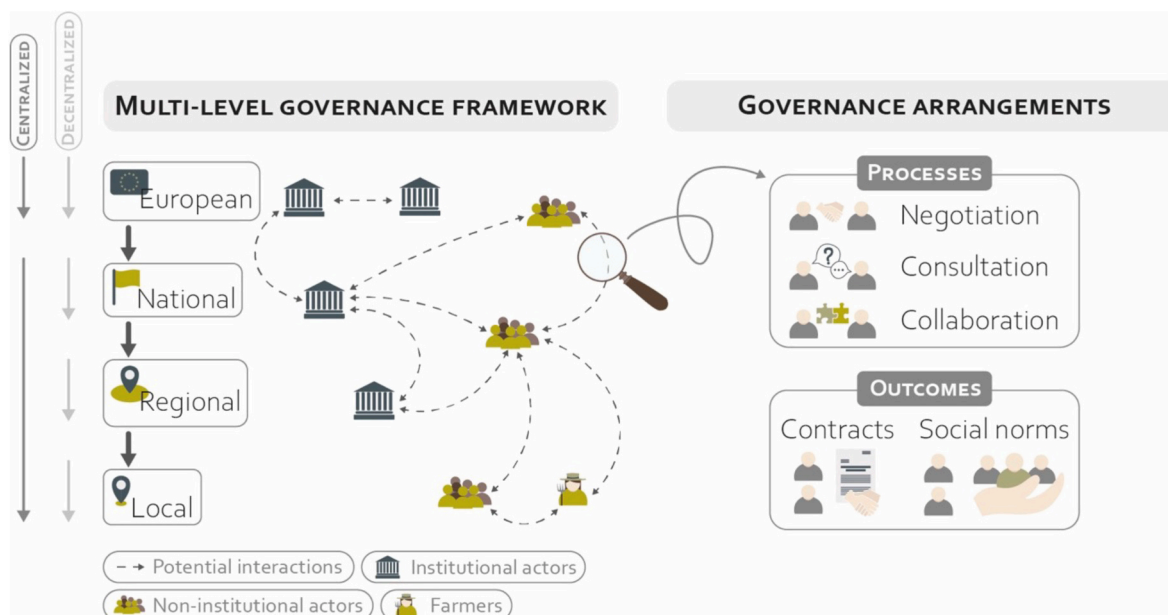


Fig. 4. An overview summarizing the main dimensions explaining the diversity of AES governance models. The figure illustrates how Member States may adopt either centralized or decentralized arrangements within a broader multi-level governance framework, involving stakeholders operating across different governance levels and geographical scales. These stakeholders include both institutional and non-institutional actors, whose interactions are mediated through processes such as negotiations, consultations, or collaborative arrangements. Such processes may take place in isolation or in combination. Ultimately, these interactions lead to two main types of outcomes: (i) formal contracts, for instance agreements between governmental agencies and farmers for AES enrollment, and (ii) informal arrangements expressed as social norms, such as the development of trust and shared expectations among actors.

Table 6
Member States and type of governance identified by the reviewed studies (i.e. centralized, decentralized or mixed, mixing elements of both type).

Member State	Type of governance	Related reviewed studies
Austria	Not specified	Vesterager et al. (2016)
Denmark	Not specified	Vesterager et al. (2016)
Finland	Decentralized	Beckmann et al. (2009)
Greece	Not specified	Vesterager et al. (2016)
Hungary	Centralized	Kovács, 2015
Belgium - Wallonia	Centralized	Beckmann et al. (2009); Dedeurwaerdere et al. (2015); Van Herzele et al. (2011); Beckmann et al. (2009); Sattler et al., 2023; Van Herzele et al. (2011); Westerink et al. (2017)
Belgium - Flanders	Decentralized	Beckmann et al. (2009); Prazan and Theesfeld (2014)
Czech Republic	Decentralized	Beckmann et al. (2009); Benoit and Patsias (2017); Sattler et al., 2023; Westerink et al. (2017)
France	Decentralized	Beckmann et al. (2009); Bethwell et al. (2022); Hauck et al. (2016); Hirsch et al. (2022); Sattler et al., 2023; Schomers et al. (2015); Weber (2014); Westerink et al. (2017); Wilson et al. (1999)
Germany	Decentralized	Beckmann et al. (2009); Lenihan and Brasier (2009); McCarthy et al. (2018); Sattler et al., 2023
Ireland	Centralized	Toderi et al. (2017)
Italy	Decentralized	Vesterager et al. (2016); Manolache et al. (2020)
Romania	Not specified	Mazorra (2001); Wilson et al. (1999)
Spain	Mixed	Alblas and van Zeben, 2023; Bazzan et al., 2023a,b; de Vries et al., 2019; Franks (2010); Runhaar et al., 2017; Smits et al. (2008); Vesterager et al. (2016); Zwaan and Goverde (2010)
The Netherlands	Mixed	Beckmann et al. (2009); Hejnowicz et al. (2016); Sattler et al., 2023; Westerink et al. (2017)
United Kingdom	Decentralized	Beckmann et al. (2009); Bethwell et al. (2022) and Vesterager et al. (2016) engage

established a multi-stakeholder committee to manage the implementation of one AES. Alblas & van Zeben (2023) and Bazzan et al. (2023), focusing on the Netherlands, highlighting a mix of the two types of governance. The Dutch system adopts a decentralized approach in AES implementation and a more centralized approach in AES design, with Provincial governments managing the former and national government for the latter, setting targets and ensuring compliance with EU requirements through national frameworks for controls and sanctions (Alblas and van Zeben, 2023; Bazzan et al., 2023). Ireland maintains a more centralized, state-led governance model for AES. The Department of Agriculture and Food exerts strong top-down control over the design and implementation of AES (Lenihan and Brasier, 2009). Belgium has two different dynamics, depending on its two regions, Wallonia and Flanders. Both Flanders and Wallonia exhibit regionalized AES governance, meaning significant decision-making and implementation power resides at the regional level, aligning with the governance structure of the country. However, they differ in the structure and centralization of their advisory systems and various governance arrangements (Beckmann et al., 2009; Dedeurwaerdere et al., 2015; Van Herzele et al., 2011; Westerink et al., 2017). Various studies have also explored Germany as a case study (Hirsch et al., 2022; Schomers et al., 2015; Wilson et al., 1999; Weber, 2014), underlying a highly decentralized approach to AES governance. The level of Länder (i.e., the regional or federal state administrative level, positioned between the national government and municipal authorities) is key for both the design and implementation of AES (Weber, 2014; Wilson et al., 1999). At the national level, the German Agriculture Ministry manages the Community contribution to financing individual schemes (Wilson et al., 1999).

The question of whether AES governance is more effective under higher or lower levels of centralization could be explored mainly through comparative analyses across Member States, shedding light on the respective advantages and limitations of each approach. Out of the 28 studies retained, six were comparative analyses (Beckmann et al., 2009; Bethwell et al., 2022; Sattler et al., 2023; Vesterager et al., 2016; Westerink et al., 2017; Wilson et al., 1999). Among these, Beckmann et al. (2009); Bethwell et al. (2022) and Vesterager et al. (2016) engage

most directly with the relationship between the degree of centralization and environmental performance. Beckmann et al. (2009) highlights the benefits of including local stakeholders and environmental NGOs, implicitly pointing towards lower levels of centralization that prioritize inclusiveness, though the emphasis is more on inclusion than on defining an optimal degree of centralization. A similar focus on local dynamics is found in Westerink et al. (2017). Vesterager et al. (2016), while addressing related questions, considers centralization mainly through political and institutional capacity, underlining their role in enabling AES to achieve environmental objectives. Bethwell et al. (2022), by contrast, stresses the influence of regional context, showing that both more centralized and more decentralized elements can be effective depending on conditions.

Also studies focusing on one case study seem to align with such conclusions; Benoit & Patsias (2017), referencing (Dinnie et al., 2015; McCauley, 2008; van Zeijl-Rozema et al., 2008), argues for a shift from command-and-control management toward bottom-up and multi-stakeholder processes that balance authority and resource sharing. The significant role of regional and local interests in AES governance suggests these dynamics can shape policy design and implementation (Mazorra, 2001). However, decentralization is complex, involving both degrees of decision-making autonomy and distinct structural choices. While some improvements can occur within existing structures, Beckmann et al. (2009) notes that others may require structural reforms. Yet, determining an 'optimal' governance model remains challenging due to differing perceptions of public goods and services. Decentralization also presents risks, as pointed out by Alblas & van Zeven (2023), as each stage of multi-level implementation introduces opportunities for goal dilution, potentially undermining the EU's objectives (Runhaar et al., 2017).

In conclusion, the reviewed studies provide a diversity of messages, underlying a potential trade-off in defining the governance model: on the one hand, it warns of weakened policy goals through decentralization; on the other hand, it emphasizes that empowering local governments can better align AES with local environmental needs. Overall, recommendations of the selected studies tend to concentrate on policy design, objectives, instruments, and funding, rather than explicitly on the degree of centralization. With the partial exception of Beckmann et al. (2009), none provide a structured comparative assessment of the conditions under which different levels of centralization contribute to AES environmental performance.

3.2.2. Governance within and across levels

Beyond the multi-level governance framework shaping decision-making in AES, the reviewed studies provide valuable insights into the decision-making process (i.e. process of evaluating options and making choices to achieve goals). The findings reveal reoccurring governance features defining the general policy framework of AES and determining how decision-making power is distributed within and across governance levels (Beckmann et al., 2009; Zwaan and Goverde, 2010). Bethwell et al. (2022) notes that vertical governance structures shape AES schemes, as the European Commission mandates Member States to implement these programs through CAP Pillar II regulations. Dedeurwaerdere et al. (2015) further emphasizes that AES is often managed by centralized follow-up committees within Member States or by regional authorities, reflecting a top-down approach in the design and monitoring of schemes. However, various studies point out a certain degree of coordination among actors at the same governance level in shaping decision-making outputs (Beckmann et al., 2009). For example, Beckmann et al. (2009) underlines the dynamics occurring at the EU level, where coordination occurs between the EU Council, Commission, and Parliament for the drafting of the EU regulations governing the CAP, and consequently the AES. (Dedeurwaerdere et al. (2015) introduce the concept of co-governance, noting that while the design features of AES typically rely on government actors, there are cases where governance is shared with non-governmental actors, thereby expanding the range of

governance levels.

3.2.3. Governance arrangements

If the distribution of decision-making power within and across levels is pivotal in shaping AES governance models, governance arrangements also play a key role by shaping actors' interactions (Meyer et al., 2015; Lien et al., 2018; Bazzan et al., 2023). The reviewed studies identify a variety of those arrangements, which we organize as follows: arrangement processes (i.e., structured interactions that organize relationships and actions among actors) and arrangement outcomes (i.e., the formal and informal agreements resulting from organized processes).

We identified three main types of arrangement processes identified in the reviewed articles: negotiations, consultations, and collaborations.

Formal and informal negotiations occur across all governance levels and influence AES design and implementation. For instance, Prazan & Theesfeld (2014) highlight negotiations between farmers and administrators regarding specific AES implementation features, such as fertilizer use at the farm level. Negotiations also occur between the EU, national and regional actors concerning AES design features (Toderi et al., 2017; Wilson et al., 1999). Consultations involve information exchanges decision-makers initiate to reduce knowledge gaps or gather feedback on AES implementation (Bazzan et al., 2023). However, as Dedeurwaerdere et al. (2015) noted, consultations are non-binding and do not shift decision-making power to other actors. Despite this, many stakeholders are frequently consulted in AES governance (Beckmann et al., 2009), often across governance levels. Collaboration is frequently mentioned in the literature but is often vaguely defined. Studies typically identify who collaborates with whom but provide limited insight into how collaboration influences decision-making.

The arrangement outcomes identified in the reviewed articles are: contracts and social norms. Contracts represent formal, binding agreements between two or more actors in AES governance. These can occur within or across governance levels. Examples include land use agreements between farmers and landowners (Hauck et al., 2016), AES contracts between regional administrations and farmers (Beckmann et al., 2009; Lenihan and Brasier, 2009; Mazorra, 2001), and agreements between the EU and Member States (Beckmann et al., 2009). AES contracts can involve individual farmers, collectives, or value chain actors (Sattler et al., 2023). The EU also imposes binding guidelines on Member States concerning contract duration, payment calculations, and monitoring systems (Prazan and Theesfeld, 2014; Schomers et al., 2015). Additionally, EU institutions are bound by public spending accountability, necessitating monitoring activities and control systems (Weber, 2014).

Social norms, as informal agreements, shape participation in AES, particularly among farmers (Dedeurwaerdere et al., 2015). Dedeurwaerdere et al. (2015) emphasize the role of personal values in motivating farmers' engagement, showing that socio-cultural and ecological considerations matter alongside economic concerns for financial viability. Their study discusses how such values can act as tipping points in decision-making, especially when farmers face choices about alternative practices and broader farm management strategies. Social norms also influence collaborative networks in governance structures. Closely related to social norms is trust, identified as a critical factor in effective AES implementation (Bazzan et al., 2023; de Vries et al., 2019; Dedeurwaerdere et al., 2015). Trust affects farmers' decisions to join collective contracts, perceptions of administrative systems, and the stringency of control systems (Smits et al., 2008). de Vries et al. (2019) introduces the concept of institutional trust, defined as "the basis for expectations towards individuals that are not familiar."

3.2.4. The actors involved in AES governance

AES governance brings together diverse actors whose interactions are mediated through agreements and frequent exchanges. The actors involved in AES governance include governmental entities at multiple levels (i.e. national, regional, and local), farmers, environmental NGOs, researchers, and public agencies. Farmers play a central role in the

operationalization of AES related farming practices, as they are responsible for implementing agri-environmental measures (Hauck et al., 2016), yet decision-making for AES design and implementation is shared across diverse actors.

This review retrieved the main types of actors mentioned across the selected studies, identifying 15 main actor types, as presented in Table 7. The studies varied in the specificity with which they identified actors. While some studies provided precise details, others used vague categories such as “intermediaries”, the “EU”, “local actors”, “policymakers”, or “farmer groups”. Such general terms often lack clarity regarding these actors’ legal status or composition. For instance, the term “policymaker” does not specify the governance level (e.g. design, implementation) or policy arena (e.g. European, national) in which they operate.

As summarized in Table 7, most actor types identified in the studies belong to the public societal sphere, reflecting the public nature of subsidies that support AES. The reviewed studies also highlight a distinction in actors’ roles in AES governance. While some actors play active, direct roles in steering the AES governance (e.g. Agricultural ministry), others are more indirectly involved (e.g. Environmental ministry). This distinction is cross-cutting public and private spheres, as both categories include actors with direct and indirect roles in AES governance (Table 7).

Multi-actor agreements are pointed out as key in AES governance. They play a role in AES governance by formalizing relationships, commitments, and interactions among diverse actors, including governmental bodies, NGOs, private sector entities, and farmers (Sattler et al., 2023). The authors point out that intermediary organizations, which could vary across national and regional contexts, facilitate communication and exchanges among stakeholders, mediating across varying levels of governance and interests (Prazan and Theesfeld, 2014;

Table 7

Main actor types identified in the selected studies, and information on their related social sphere, their main role in AES governance and their influence, either direct or indirect, of the AES decision-making process.

ID	Actors	Societal sphere	Role	Influence on AES decision-making process
1	Agricultural administrations	Public	Administrative	Direct
2	Agricultural ministry	Public	Regulative	Direct
3	Departmental and regional councils	Public	Regulative & administrative	Direct
4	Environmental administrations	Public	Administrative	Indirect
5	Environmental ministry	Public	Regulative	Indirect
6	European institutions	Public	Regulative	Direct
7	Farmer advisors	Private or public	Advice	Indirect
8	Farmers	Private	Operationalization	Mixed
9	Farmers associations	Private or public	Advocacy and representative	Direct
10	Farmers collectives	Private or public	Operationalization	Mixed
11	Financial institutions	Private	Finance	Indirect
12	Governmental agencies	Public	Regulative & administrative	Direct
13	Municipalities	Public	Regulative & administrative	Indirect
14	National government	Public	Regulative	Direct
15	NGOs & environmental associations	Non-governmental	Advocacy	Indirect

Schomers et al., 2015; Westerink et al., 2017). Interactions among actors are mediated through formal networks, such as multi-stakeholder committees, and informal mechanisms, such as trust-building initiatives and knowledge-sharing platforms. For example, in the Netherlands, farmers’ collectives work with provinces to develop AES plans while maintaining a dialogue with national and European bodies through organizations like *BoerenNatuur* (i.e., an organization that coordinates farmer-led collectives for AES implementation under AES collective contracts) (de Vries et al., 2019). These arrangements are often characterized by decentralized governance structures, participatory decision-making, and collaborative implementation processes. Multi-stakeholder arrangements often foster inclusivity and coordination to align priorities and contributions (Prager and Nagel, 2008). Yet, it is pointed out that some actors play a dominant role in AES governance. This is mostly true for agricultural ministerial departments and related agencies that dominate the decision-making of AES governance (Beckmann et al., 2009; Benoit and Patsias, 2017; Westerink et al., 2017).

Geographical variation emerges when comparing the reviewed studies. For example, in Germany, local conservation associations (LCAs) exemplify bottom-up governance that affects the interactions across actors, with strong NGO participation. On the other hand, the decentralized French model often retains centralized oversight (Benoit and Patsias, 2017; Schomers et al., 2015). Dutch AES models prioritize informal interactions and collective decision-making among farmers, distinguishing them from more hierarchical approaches observed elsewhere (de Vries et al., 2019).

3.3. Mechanisms & factors linking AES governance to AES environmental performance

This section answers the second research question, providing insights into the several factors the reviewed studies identified as linking AES governance features to environmental performance.

In the reviewed studies, the concept of environmental performance is not always defined, and when is the case, the studies provide a diversity of perspectives. Some authors, such as Bazzan et al. (2023); Prazan and Theesfeld (2014) and Van Herzele et al. (2011), use the lens of success, focusing on the design features of AES and how these influence implementation outcomes. However, as Bazzan et al. (2023) notes, linking design success directly to measurable environmental outcomes is complex and often inconclusive.

Across the reviewed corpus, the term “performance” appears in 18 papers, typically referring either to the capacity of AES to deliver certain public goods (Hejnowicz et al., 2016) or to the extent to which they meet their stated objectives (Runhaar et al., 2017). The term is frequently associated with, or used interchangeably with, effectiveness (e.g., Beckmann et al., 2009; de Vries et al., 2019; Hirsch et al., 2022; Schomers et al., 2015), and may be qualified as either environmental or ecological performance. The term is frequently associated with, or used interchangeably with, effectiveness (Beckmann et al., 2009; Schomers et al., 2015), and may be qualified as either environmental or ecological performance. Other authors explicitly favour effectiveness (e.g., Beckmann et al., 2009; de Vries et al., 2019; Hirsch et al., 2022; Schomers et al., 2015), defining it as the ability to achieve environmental aims. Beckmann et al. (2009), Hirsch et al. (2022) also discuss efficiency, distinguishing between environmental effectiveness and economic efficiency. For the purposes of this study, environmental performance is defined as the extent to which the environmental objectives of an AES can best be achieved. This definition serves as a broad common denominator across the reviewed studies. Even when studies do not explicitly define the term, apply differing definitions, or use alternative terminology such as effectiveness or success, their usage can, at least partially, be related to this objective-oriented understanding.

The factors identified in the literature can be categorized into three primary groups: design-related, actor-related, and implementation-

related. A cross-cutting factor is also identified. The next section examines each category of governance-related factors in detail, with a summary presented in Fig. 5.

While these factors do not directly determine environmental performance, they influence two key mechanisms: the extent of farmer participation in AES and the ecological impact of AES.

For the latter, the notion of ecological impact is here framed from a policy perspective, mainly in relation to the dimensions specified in policy objectives, often referring to issues on species richness (Smits et al., 2008). This conceptualization may differ from definitions used in other literature streams, such as ecology or ecosystem services, where the notion of ecological impact is often broader and more finely articulated. This perspective is consistent with Smits et al. (2008) who argue that AES efficacy depends on the participation rate among farmers and the ecological results of farming practices under AES. Rather than treating farmers' participation and ecological impact as final outcomes, we conceptualize them as pathways through which governance-related factors shape AES environmental performance by influencing participation patterns and the ecological impact of AES interventions (Fig. 5).

3.3.1. Actor-related factors

Actor-related factors include the role of the participation of different types of actors in AES governance, their interactions, and the power dynamics resulting from these interactions.

Discussions on actor participation primarily focus on including environmental actors (e.g., Environmental ministries, NGOs, and environmental associations) in AES actor networks (Beckmann et al., 2009; Benoit and Patsias, 2017; Dedeurwaerdere et al., 2015) and the degree of decentralization, including the involvement of local actors

(Beckmann et al., 2009; Toderi et al., 2017). Several studies emphasize the importance of shared responsibility through co-management dynamics (Toderi et al., 2017), particularly in phases such as AES design (Bazzan et al., 2023) or other implementation stages (Van Herzele et al., 2011).

Power dynamics are widely acknowledged in the literature (Beckmann et al., 2009; Benoit and Patsias, 2017; Lenihan and Brasier, 2009; Manolache et al., 2020; Mazorra, 2001; Toderi et al., 2017). There is a general consensus that agricultural administrations and farmers' associations hold the most influence in AES governance (Beckmann et al., 2009; Benoit and Patsias, 2017; Lenihan and Brasier, 2009). Benoit & Patsias (2017) highlight that an equivalent collaboration with environmental stakeholders does not counterbalance the historical partnership between administrative bodies and agricultural organizations. This aligns with broader concerns regarding the limited participation of environmental actors, which does not allow their knowledge and agendas to be part of the AES governance and thus potentially limiting AES environmental performance. Toderi et al. (2017), referencing to Prager & Nagel (2008) points out that authorities often perceive participatory approaches as threatening their power and legitimacy.

3.3.2. Design-related factors

Design-related factors encompass structural and strategic dimensions central to framing AES policy. Based on the literature review, we identified four key categories of factors linked to AES environmental performance: spatial mismatches, AES contract features, selection bias within the AES farmer population, and AES target setting.

A significant concern involves AES zoning, with studies frequently

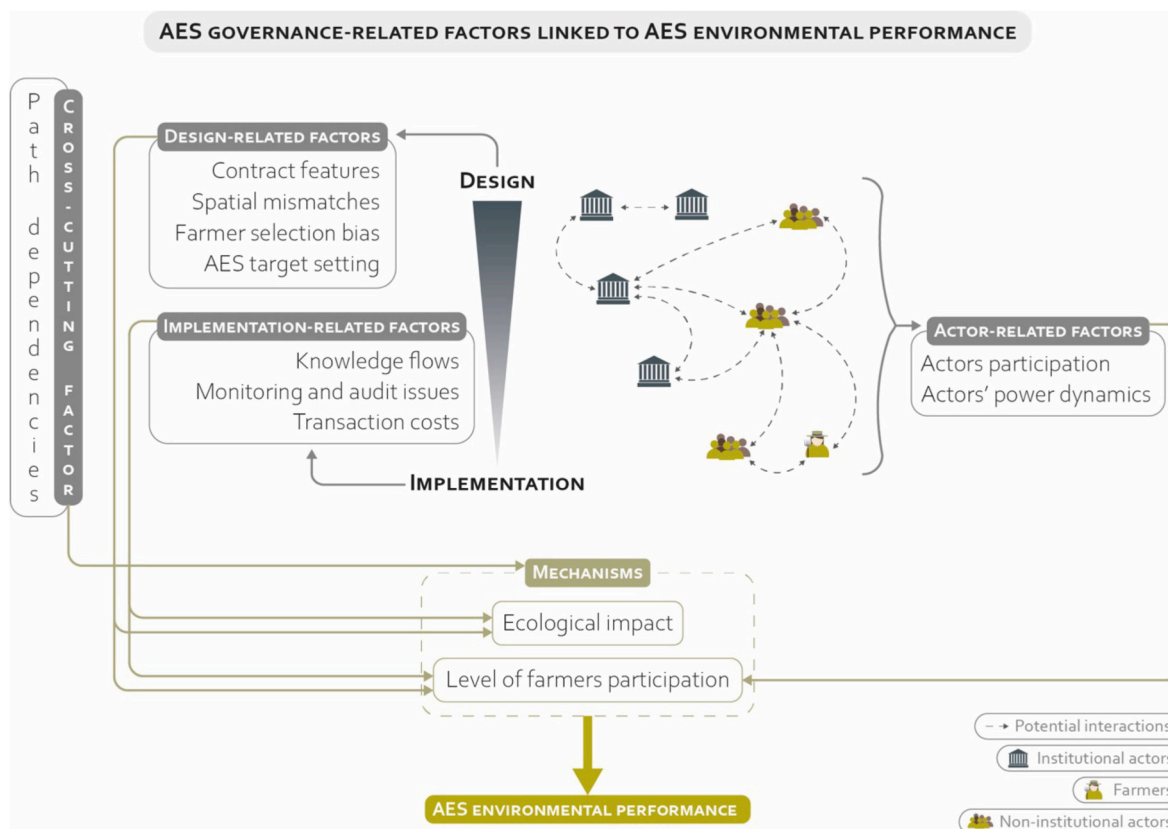


Fig. 5. An overview of the main governance factors linked to the environmental performance of AES. The figure distinguishes three core categories: design-related factors, implementation-related factors, and actor-related factors. Each of these operates at a different stage of the governance process: design-related factors at the policy formulation stage, implementation-related factors during delivery, and actor-related factors more broadly across the governance process through their interactions. A fourth factor, path dependency, is identified as a cross-cutting factor influencing all stages. These governance factors shape AES environmental performance through two key mechanisms: (i) the ecological impact generated by AES implementation, and (ii) the level of farmers' participation.

emphasizing spatial mismatches between AES measures and environmental threats and the fragmentation of AES implementation across landscapes (de Vries et al., 2019; Prazan and Theesfeld, 2014; Schomers et al., 2015; Smits et al., 2008; Toderi et al., 2017; Westerink et al., 2017). These mismatches arise because ecological and biophysical processes in agriculture operate at landscape rather than farm scales (Kleijn et al., 2011 citing McKenzie et al., 2013; Prager et al., 2012; Toderi et al., 2017). AES measures often target individual farms instead of broader contiguous areas, limiting their environmental performance. Innovative contract models, such as collective AES contracts, are proposed as solutions. These models show ecological and economic potential by fostering cross-farm territorial approaches (Bazzan et al., 2023) and reducing transaction costs (Franks, 2010). However, administrative constraints, including payment levels and subsidy distribution, remain unresolved.

AES contract design involves balancing broad participation with ambitious environmental goals. Benoit & Patsias (2017) observes that AES governance actors' reliance on farmers' willingness often leads to strategic negotiations that dilute expected AES environmental effects. Weber (2014) corroborates this, noting concessions in scheme design and the abandonment of specific environmental objectives. Moreover, the selected studies highlight the issue of contract duration, presenting conflicting perspectives. While some argue that the standard duration of five years is excessively long (Benoit and Patsias, 2017; Mazorra, 2001), others contend it is too short (Zwaan and Goverde, 2010). Additionally, Smits et al. (2008) emphasizes the importance of contract renewal, noting that nature restoration is a long-term endeavour that spans several years (Smits et al., 2008).

Selection bias within the AES farmer population raises concerns about the effectiveness of incentives. The reviewed studies question whether AES merely compensates for actions already planned or ongoing. Sattler et al. (2023) argue that by targeting only farmers, AES overlooks the broader array of actors, including landowners, NGOs, food processors, consumers, and residents, who can significantly influence environmental performance.

There is a consensus across studies that vaguely defined environmental objectives and targets, (e.g. encourage farmers to protect and enhance the environment on their farmland by paying them for the provision of environmental services) hinder AES environmental performance. Effective target setting should integrate broader sectoral values and practices to ensure coherence and efficacy of the policy instruments (Alblas and van Zeven, 2023; Prager and Nagel, 2008; Runhaar et al., 2017; Toderi et al., 2017).

3.3.3. Implementation-related factors

Implementation-related factors address the operational challenges encountered during the AES implementation phase. The review identifies three key categories: knowledge flows, transaction costs, and monitoring and audit issues.

Knowledge flows are a recurring theme in the reviewed studies, highlighting two main aspects: the limited availability of knowledge in AES decision-making and insufficient integration of knowledge across diverse AES governance actors. As for the type of knowledge, agricultural expertise and management skills dominate the discourse, with some references to the value of local knowledge (Benoit and Patsias, 2017; Manolache et al., 2020; Sattler et al., 2023; Toderi et al., 2017). However, the lack of further details makes it difficult to understand what is meant by local knowledge.

Limited knowledge, either technical or managerial, negatively impacts decision-making across governance levels (Hejnowicz et al., 2016; Prazan and Theesfeld, 2014; Toderi et al., 2017). Beckmann et al. (2009) goes one step further highlighting that decision-making processes influence how information is collected and used, with information asymmetry often reinforcing power dynamics and excluding actors lacking perceived legitimacy (Benoit and Patsias, 2017).

Monitoring and audit are essential for adapting management

strategies and enabling calibration of AES measures or their spatial targeting (Hejnowicz et al., 2016; Benoit and Patsias, 2017; Boonstra et al., 2021 as cited by Sattler et al., 2023). While monitoring supports learning throughout the implementation process, its complexity of related administrative features (e.g. reporting, on-site inspections, audits) presents significant challenges, decreasing its potential contribution to improving AES implementation.

AES literature extensively discusses transaction costs, with references highlighting their influence on environmental performance. Cost and environmental efficiency are closely linked and often influenced by shared factors (Franks, 2010). As a voluntary scheme, AES participation is sensitive to private transaction costs: higher costs reduce economic efficiency, participation rates, and environmental performance (Franks, 2010; Schomers et al., 2015; Weber, 2014). On a broader scale, Beckmann explores the role of centralization in AES administration, noting that increased decentralization typically raises transaction costs.

3.3.4. Cross-cutting factor: path dependency

A cross-cutting factor is path dependency, meaning the influence of historical decisions, past institutional arrangements, socio-cultural norms, and actor interactions on the current and future design and implementation of AES policies. In the French case, Benoit & Patsias (2017) highlight how long-standing collaborations between agricultural organizations and state agencies create institutional inertia, prioritizing traditional corporatist policymaking over ecological reforms. This entrenched alliance is not counterbalanced by similar partnerships in the environmental sector, limiting the potential for "green" advancements. The authors also highlight a legacy of administrative silos, both between agricultural and environmental administrations and within the latter (e.g., environmental departments and water agencies). Such fragmentation reinforces existing power imbalances between policy domains, constraining cross-cutting orientations across agricultural and environmental agendas in AES governance.

Path dependency linked to governance factors also emerges in other national contexts. In Germany, Manolache et al. (2020) illustrate how the success of grassland management networks depends less on past farming practices than on administrative traditions. Social cohesion, clearly defined rules, and communal forms of management appear as enabling factors, while political and institutional instability act as barriers to successful AES implementation. Schomers et al. (2015) stress that the formation of influential local groups depends on their ability to manage conflicts and reconcile diverging interests, pointing to the evolving nature of actor dynamics. This resonates with findings by Westerink et al. (2017), who stresses how in the Netherlands farmer collectives emerged as central actors in AES governance, and by Smits et al. (2008), who shows how changing property rights shape governance trajectories.

The influence of historical trajectories is further emphasized by Prazan & Theesfeld (2014) in the Czech Republic. They argue that the rapid institutional transformation of the early 1990s created formal structures almost overnight, while informal norms and practices changed more slowly. This mismatch illustrates how institutional legacies from the socialist period continue to shape the effectiveness of agri-environmental contracts, demonstrating the enduring influence of past paths on current governance dynamics.

4. Discussion

As highlighted by Uthes & Matzdorf (2013), the body of literature on agri-environmental schemes (AES) has continued to expand, encompassing diverse research topics, methodological approaches, and geographical contexts. In recent years, AES governance has emerged as a distinct branch of this literature. While pioneering studies date back to the 1990s and early 2000s, research in this area has grown substantially since 2010. Although several literature reviews have addressed key thematic aspects of AES, such as the comprehensive review by Uthes &

Matzdorf (2013), a synthesis of the main insights specifically related to AES governance has been lacking. This literature review seeks to address this gap by analysing insights from existing research over the past three decades, highlighting commonalities and differences across AES governance models in various EU Member States, and examining lesson learnt on how governance features influence AES environmental performance. Our findings reinforce the observations regarding AES governance's complex nature, characterized by a diverse array of actors and interactions (Uthes and Matzdorf, 2013).

A key takeaway from the review is that governance is a broad and often normatively framed concept, with its interpretation varying significantly across contexts and authors. This aligns with broader governance literature beyond AES (e.g. Benz and Papadopoulos, 2006; Hill and Varone, 2016; Ruhanen et al., 2010; van Zeijl-Rozema et al., 2008). The reviewed studies define and attribute governance features such as centralization and collaboration inconsistently. Various studies apply their implicit interpretation, often leading to normative assessments of what constitutes "good" or "bad" governance for improving AES environmental performance. However, the systematic analysis conducted in this study reveals recurring elements across the studies, indicating a general coherence in identifying trade-offs associated with different governance models (i.e. centralization vs decentralization, multi-stakeholder engagement, decision-making across and within levels).

The overarching question remains: how can governance models enhance AES environmental performance? Some studies address this question by focusing on specific and innovative AES contract designs, examining governance models embedded within particular contract features, such as collective AES or result-based AES (Bazzan et al., 2023; de Vries et al., 2019; McCarthy et al., 2018). Other studies take a geographically specific approach (Dedeurwaerdere et al., 2015; Hirsch et al., 2022; Lenihan and Brasier, 2009; Weber, 2014), offering high-quality empirical evidence on governance and environmental performance in specific settings.

While these case-specific studies provide critical insights, they offer limited reflections on AES as a policy instrument within the broader constellation of CAP measures. This gap is particularly relevant given the potential interactions between AES and other CAP instruments, which directly influence governance dynamics of the EU agri-environmental policy. Cross-comparative analyses help address this limitation (e.g. Beckmann et al., 2009; Sattler et al., 2023; Westerink et al., 2017), offering a more integrated perspective on AES governance. Nevertheless, further research is needed to explore how different governance configurations within AES interact with the wider CAP framework and the EU agri-environmental policy.

A central issue that emerges from the reviewed studies concerns the tension between centralization and decentralization, with implications for decision-making power across multiple levels. This tension raises a fundamental dilemma: whether to expand the decision-making base to enhance policy relevance and inclusivity or to prioritize a more centralized approach for effective and targeted policy design and implementation. On this, the literature suggests no universal governance solution, and the diversity of proposed approaches does not guarantee that adapted solutions will always be suitable. Decentralization and multi-actor engagement are necessary for local relevance (Benoit and Patsias, 2017; Mazorra, 2001). However, a certain degree of centralization can avoid diluting objectives (Alblas and van Zeven, 2023; Runhaar et al., 2017). Higher environmental performance of agri-environmental schemes, and more broadly policies, depend on a strategic optimization of these dimensions. Some perspectives emphasize decentralization as a means to enhance actor representation and inclusiveness, bridging the gap between EU institutions and local realities, and empowering stakeholders. However, other perspectives view decentralization as a potential deregulation and policy dilution vehicle, accelerating EU policy fragmentation and weakening enforcement (Alblas and van Zeven, 2023; Runhaar et al., 2017). Identifying clear

policy recommendations that privilege one governance model over other risks overlooking the inherent diversity of Member States. As highlighted by Buller et al. (2017), agri-environmental schemes are deeply embedded in the cultural, institutional, and landscape heritage of each country, making the search for a "perfect" degree of centralization more of an idealistic ambition than a realistic or policy-relevant objective. For this, comparative analyses such as Buller et al., 2017 or others included in our review (Beckmann et al., 2009; Bethwell et al., 2022; Vesterager et al., 2016; Westerink et al., 2017; Wilson et al., 1999; Sattler et al., 2023) are particularly valuable as they allow tracing pathways that have led (or failed to lead) to more successful policy implementation in specific geographical contexts. Approaching solutions in their plurality and as pathways, instead of oversimplified list of recommendations allows the identification of context-sensitive factors that can be fine-tuned to enhance the effectiveness of policy strategies.

Another key insight from our review is the strong imbalance in the literature's focus, with a predominant emphasis on AES technicalities of related farming practices, overlooking the role of actors, governance, and the importance of governance and institutional arrangements. This corroborates earlier observations by Uthes & Matzdorf (2013), and is reflected in the limited selection of our review, which ultimately retained only 28 studies from an initial pool of over a thousand papers. Despite this, the available literature underscores the critical role of governance features in shaping AES's environmental potential. While governance may not directly influence environmental performance, it is an essential enabler (or barrier), opening (or closing) windows of opportunity for successful implementation. A further imbalance concerns the geographical representation of case studies. Our review highlights an over-representation of northern EU countries, with comparatively fewer studies addressing southern Member States. As Wilson et al. (1999) show in their comparison of Germany and Spain, institutional and cultural differences are strongly shaped by both national heritage and broader north-south dynamics. While one should avoid over-simplifying this polarization, such differences are echoed in the extensive review provided by Buller et al. (2017). The relative under-representation of southern contexts in the literature raises concerns, as could partly prevent grasping a full picture of the diversity of governance models within the EU geographical contexts. Addressing this gap would be a valuable research avenue to ensure a more comprehensive assessment of AES governance across the EU.

A fundamental argument emerging from this review is that even the most well-designed AES measures will fail to achieve their intended outcomes if the governance context does not provide the conditions for effective implementation. Our review identifies three overarching governance-related factors influencing AES environmental performance: actor, design, and implementation-related factors. These categories highlight the key areas where policymakers should concentrate their efforts to enhance the likelihood of high AES environmental performance and mitigate potential failures. Together, these dimensions suggest the need for systematic reflection on i) who should be involved, under which role and through which interaction processes (Sattler et al., 2023; Borniotta et al., 2025), ii) which design features can most effectively combine farmer participation with ecological impact (Alblas and van Zeven, 2023; Benoit and Patsias, 2017; Smits et al., 2008), and iii) how implementation processes can be organized to ensure high coherence (Beckmann et al., 2009; Hejnowicz et al., 2016; Smits et al., 2008).

The findings highlight that actor-related factors, particularly power imbalances in AES governance, limit the inclusion of environmental actors, potentially constraining the environmental performance of AES (Beckmann et al., 2009; Benoit and Patsias, 2017). Design-related factors, such as spatial mismatches and contract structures, further hinder effectiveness, with the dominance of farm-level measures failing to address landscape-scale ecological processes (Prazan and Theesfeld, 2014; Schomers et al., 2015; Smits et al., 2008; Westerink et al., 2017; Toderi et al., 2017; de Vries et al., 2019). Implementation challenges, including limited knowledge flows, high transaction costs, and complex

monitoring requirements, reduce efficiency and participation (Benoit and Patsias, 2017; Franks, 2010; Hejnowicz et al., 2016; Prazan and Theesfeld, 2014; Schomers et al., 2015; Toderi et al., 2017). Moreover, path dependency reinforces institutional inertia, preserving traditional policymaking structures that favour agricultural interests over ecological priorities (Benoit and Patsias, 2017; McCarthy et al., 2018; Prazan and Theesfeld, 2014). Despite its critical importance, this aspect remains relatively understudied in the literature. The complex nature of AES governance, involving multiple policy arenas and a blend of governance features evolving over time, creates a multi-actor setting where historical institutional arrangements shape the governance field where stakeholders bring their own agendas and interests.

5. Conclusions

This review has provided a comprehensive and systematic analysis of the fragmented AES governance literature. By analysing AES design, implementation, and actor interactions, it has highlighted the diversity of governance approaches and their implications for environmental performance. Our results show that governance features influence the AES environmental performance, which varies across contexts, aligning with the various governance models implemented across EU member states. This diversity is rooted in its legislative framework, particularly the principle of subsidiarity, which defines the boundaries of AES as a policy instrument and, more broadly, shapes the EU's agri-environmental policy landscape. AES governance models are shaped by different degrees of centralization, with historical relationships between key practitioners shaping the current policy dynamics and consequently the mandate among the various actors involved. Additionally, AES governance operates within a multi-level framework, encompassing multiple policy arenas that further add complexity. A "one-size-fits-all" approach does not apply to AES, yet the assumption that "adapted-solutions-always-fit" is also contested, as decentralization alone does not guarantee high environmental performance and the achievement of environmental objectives and targets. In our paper, we suggest that advancing AES effectiveness requires closer attention to three interdependent governance dimensions: the actors involved and their modes of interaction, the design features that can jointly foster farmer participation and ecological impact, and the implementation processes that ensure coherence and consistency across levels.

At the same time, the review points to important gaps and ambiguities that future research should address. First, the literature is heavily weighted towards northern EU case studies, providing a partial picture into governance dynamics in southern contexts, despite the difference in institutional and cultural contexts. Second, governance choices are often insufficiently linked to environmental performance. Clarifying what is meant by "environmental performance," and avoiding vague or weakly operationalized concepts, will be critical considering the CAP's increasing subsidiarity and Member State discretion. For this our review points out the importance of comparative analyses, as they allow tracing pathways that have led (or not) to more successful outcomes in specific geographical contexts, thereby identifying context-sensitive factors rather than oversimplified solutions. Additionally, integrating governance perspectives more closely with economic and ecological ones would enhance the relevance of future research for policy design and implementation. Finally, widely used terms such as "collaboration" or "governance" require further operationalization to uncover what they mean in practice for AES design and implementation, and how they translate into concrete changes in actor behaviors and interactions.

CRedit authorship contribution statement

Diana Borniotto: Writing – original draft, Investigation, Formal analysis, Data curation, Conceptualization. **Philippe V. Baret:** Writing – review & editing, Validation, Supervision, Conceptualization.

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Declaration of competing interest

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jrurstud.2025.103924>.

Data availability

All data used for the research is available in the supplementary materials

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