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# Design rules for successful governmental payments for ecosystem services: Taking agri-environmental measures in Germany as an example



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## ABSTRACT

In recent years, increasing attention has been paid to financial environmental policy instruments that have played important roles in solving agri-environmental problems throughout the world, particularly in the European Union and the United States. The ample and increasing literature on Payments for Ecosystem Services (PES) and agri-environmental measures (AEMs), generally understood as governmental PES, shows that certain single design rules may have an impact on the success of a particular measure. Based on this research, we focused on the interplay of several design rules and conducted a comparative analysis of AEMs' institutional arrangements by examining 49 German cases. We analyzed the effects of the design rules and certain rule combinations on the success of AEMs. Compliance and noncompliance with the hypothesized design rules and the success of the AEMs were surveyed by questioning the responsible agricultural administration and the AEMs' mid-term evaluators. The different rules were evaluated in regard to their necessity and sufficiency for success using Qualitative Comparative Analysis (QCA). Our results show that combinations of certain design rules such as environmental goal targeting and area targeting conditioned the success of the AEMs. Hence, we generalize design principles for AEMs and discuss implications for the general advancement of ecosystem services and the PES approach in agri-environmental policies. Moreover, we highlight the relevance of the results for governmental PES program research and design worldwide.

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## 1. Introduction

The concept of Payments for Ecosystem Services (PES) is diversely defined, and the term has been used to refer to various national conservation approaches that create incentives for the provision of ecosystem services (ES) worldwide (cf. [Muradian et al., 2010](#); [Vatn, 2010](#)) and particularly to large governmental payment schemes known as agri-environmental measures (AEMs). Thereby, AEMs in the European Union (EU) and the United States (US) represent the largest PES programs in the world ([Schomers and Matzdorf, 2013](#)). Such a broadly defined PES idea incorporates hybrid governance structures, including hierarchies as well as market concepts ([Matzdorf et al., 2013](#); [Vatn, 2010](#)). Thus, the state may play a major role, either as the legal driver of ES demand and/or as an ES buyer. By classifying PES schemes based on the level of

governmental interventions, the governmental PES programs analyzed in our paper were those in which the state acts as the buyer of the ES on behalf of the public, which represents the service user. Such paradigms are typical of governmental PES programs and are especially prevalent in EU and US agri-environmental payments as well as large Latin American forest-environmental payments (cf. [Matzdorf et al., 2013](#)). Following [Schomers and Matzdorf \(2013\)](#), we understand that due to the extensive experience with national governmental payment programs in the EU, the international PES discourse could profit from an exchange between AEM and PES research. Additionally, we also perceive that the PES approach could significantly add to the AEM research, particularly in light of the general tendency to integrate the ES approach into EU and US agricultural policies ([Matzdorf and Meyer, 2014](#)). Thus, we analyzed the design of successful AEMs against the background of the PES concept.

Within the European agricultural landscape, farmers have both a significant positive and negative impact on the environment. Governmental PES in the form of AEMs have been of major

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importance for solving agri-environmental problems throughout the EU for many years. There are AEM that are developed and financed within the framework of the European Common Agricultural Policy (CAP) by the EU and member states, and conservation management agreements that are solely under the responsibility of individual member states (cf. Kirschke et al., 2007). EU expenditures on AEMs have been significant, amounting to nearly 20 billion EUR for the period from 2007 to 2013 (European Commission, 2014). The EU imposes basic institutional requirements for CAP AEMs that are implemented by the member states, and it contributes financially. In the member state of Germany, our example, the general responsibility for agri-environmental policy making and implementation lies with the federal states. Thus, federal states have their own conservation protection agreements that we have included in our study and defined as AEMs because they are largely comparable to the EU-induced AEMs. Such agreements existed before the EU AEMs, are now implemented through the same rural development plans and are successively integrated into EU AEM funding structures (LANUV NRW, 2014).

Agri-environmental measures encompass many hierarchical elements in addition to the payments, including objectives regarding environmental improvement, commodities, and prices delineated by the state. Correspondingly, Mettepenningen et al. (2009) described AEMs as “take it or leave it” contracts with no opportunity for negotiation. Due to the large impact of AEMs as environmental governance instruments, the successful design of AEMs is of great importance. Agri-environmental measures essentially function as follows: Farmers agree to adopt predefined practices or to provide predefined ecological conditions and therefore receive government payments compensating them for additional costs and loss of income. The institutional arrangements can vary in terms of, for example, the area targeted, the payment mode, and the involvement of nature protection agencies. Various studies on PES and AEMs demonstrate that single rules provided by the instruments may correlate with their success.

Correspondingly, different PES programs have been analyzed in terms of various aspects (cf. Tacconi, 2012; Kemkes et al., 2010; Muradian et al., 2010; Vatn, 2010; Kosoy and Corbera, 2010; Fisher et al., 2009; Engel et al., 2008; Wunder et al., 2008), and differences, similarities, strengths, weaknesses, limitations, and implementation issues have been shown. There are also specific comparative PES classifications that largely do not differentiate between governmental and civil society PES programs (Pirard, 2012; Wunder et al., 2008) or targeted civil society schemes (Sattler et al., 2013). Furthermore, a broad literature on AEMs and their role as environmental policy instruments has developed, including effectiveness and efficiency studies and examinations of different single institutional aspects. In particular, analyses have been conducted on AEMs' environmental effects (Purvis et al., 2009; Finn et al., 2009), the influence of certain institutions on participation and adoption (Schomers et al., 2015; Mettepenningen et al., 2013), targeting effects (Uthes et al., 2010), and how farmers should be remunerated (Matzdorf and Lorenz, 2010; Klimek et al., 2008). However, to date, we have not found any encompassing comparative analyses of the institutional arrangements in governmental AEMs that include various cases as well as the various rules and their interplay. Moreover, most of the literature on PES presents individually examined cases, particularly in developing countries (e.g., Corbera et al., 2009). Building on the single-rule analyses and proceeding one step further, we analyzed the effects of certain design rules and certain rule combinations on the success of AEMs in Germany to determine general design principles for AEMs and to add to the PES discussion in general.

Our comparative institutional analysis relied on state-provided, non-negotiable basic AEM rules of implementation and application that are found in various governmental PES programs worldwide. The analysis attempts to determine a preferred institutional arrangement among several possibilities (cf. Monsees, 2008). Therefore, we compared different AEM arrangements, framed as rule sets, to understand which rules are necessary and sufficient for the success of such measures. Based on our results, we provide policy design recommendations for AEMs in the EU and the US but also for governmental PES programs in general. In summary, the following questions are answered:

- Which rules could be relevant for the success of AEMs and why?
- What are the necessary and sufficient conditions for the success of German AEMs?
- What are the implications for AEMs and governmental PES design rules?

Our hypotheses are derived in Section 2. Section 3 describes our materials and methods and is divided into data collection and data analysis. Section 4 presents our results, in particular, survey results, necessary and sufficient conditions, inconsistencies, and non-coverage. Finally, Section 5 discusses the results, and Section 6 concludes.

## 2. Theory

We hypothesized single rules that may be relevant for the success of AEMs in terms of effectiveness aspects. Corresponding to our understanding of AEMs as governmental PES, we started with rules that are assumed to be important within the general PES literature (reviewed by Sattler et al., 2013): the ES, scale, payments, actors, and their further specifications. Based on these contributions, we concretized the general PES aspects against the background of the general AEM literature and the German CAP mid-term evaluations. Thereby, we focused on the most frequently observed, relevant aspects of German AEMs. Thus, we present a nexus of the most relevant aspects from the PES and AEM literature. We determined that nine single rules are possibly relevant. However, certain general PES aspects have not been included because they did not appear to be relevant in the context of AEMs. Overall, and of particular importance for the following analysis, we assumed that the success of AEMs is causally complex, and certain combinations of the single rules are relevant for success.

**Hypothesis 1.** Focusing on either one environmental goal or bundling goals is relevant (H1).

Purvis et al. (2009) examined different single ES provisions for which AEMs were designed, namely, soil quality and stability, water quantity and quality, conservation of wildlife species and habitats, and esthetic and sociocultural value of the landscape (see also Primdahl et al., 2010). AEMs may specifically address single ES or bundles of several ES (cf. Kemkes et al., 2010; Redford and Adams, 2009; Engel et al., 2008). For PES, the bundling of ES is considered a way to optimize overall ES provisions (cf. Kosoy et al., 2008). However, the single ES targeting of a certain instrument may avoid trade-offs and make the instrument more effective (cf. Schader et al., 2014). To develop a hypothesis for our study, we referred to four different environmental goals framed within CAP evaluations: soil, water, biodiversity, and landscape. We were aware that the goals do not present final ES and that more than one ecosystem service can contribute to a certain goal.

**Hypothesis 2.** AEM application to a certain area or habitat is relevant (H2).

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