

Article

## How Local Intermediaries Improve the Effectiveness of Public Payment for Ecosystem Services Programs: The Role of Networks and Agri-Environmental Assistance

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**Abstract:** Large governmental payments for ecosystem services programs (PES) have frequently been criticized for their limited environmental effectiveness. The use of local intermediaries has been considered as one possibility for improving the environmental effectiveness of such programs. German Landcare Associations (LCAs) have been identified as one intermediary that holds the potential to positively influence the implementation of agri-environmental measures (AEMs). This paper empirically assesses the involvement of LCAs in the context of AEM implementation in Germany. An online questionnaire was distributed to all LCAs in Germany. In a first step, we examine if LCAs (1) provide social networks between stakeholders and (2) provide agri-environmental information and assistance to farmers. In a second step, the LCAs assess (3) their perception of how strongly their work influences farmers' participation in PES schemes and (4) if they pursue the spatial targeting of AEMs. In a third step, we relate the relative level of social networks and the provision of agri-environmental information and assistance to their stated influence on farmers' participation in and spatial targeting of AEMs. Finally we derive overall conclusions on how intermediaries can enhance the effectiveness of PES programs in general.

**Keywords:** agri-environment measures; land use conflict and governance; social capital; local embeddedness; payments for environmental services

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## 1. Introduction

Policy instruments that use economic incentives for the governance of ecosystem services and the management of land use conflicts, most common within agricultural landscapes, have gained in importance over the past years [1]. The number of publications referring to the concept of payments for ecosystem services (PES) has been increasing substantially over the past two decades at the international level [2]. The majority of PES cases refer to large governmental payment programs, such as the Farm Bill in the United States or agri-environmental measures (AEMs) in the European Union (EU) [3,4].

In Europe, most AEMs—defined as governmental PES—are part of the second pillar of the Common Agricultural Policy (CAP) of the European Union (EU) and are designed to encourage farmers to enhance environmental stewardship. The overall framework for AEMs is set by the European Union (EU), while the specific policy design of the individual measures is developed at the individual member state level. In Germany, the individual agri-environmental regulations and the design of individual measures are executed at the federal state level—the individual Länder [5,6]. AEMs require farmers to adopt predefined management practices that are considered to provide certain ecological benefits. Farmers receive governmental payments to compensate for their opportunity costs and for additional costs. The adoption of AEMs is voluntary on the part of farmers; contracts are commonly “take it or leave it contracts” [7]. However, the large governmental agri-environmental programs have frequently been criticized for their low levels of environmental effectiveness [8–11]. Major reasons for the low levels of environmental effectiveness of AEMs are (1) the low participation rates of individual farmers, in particular for those measures that impose more substantial management prescriptions and (2) insufficient spatial targeting of measures and schemes. Farmers’ participation in AEMs is a basic requirement to achieve any environmental effect at all [5]. Increasing participation rates will specifically provide higher levels of environmental benefits (environmental effectiveness) if AEMs are targeted [8,12–15]. Spatial targeting can be conducted at two levels. Firstly, spatial targeting deliberately directs AEMs to the most suitable or vulnerable areas or land parcels. Secondly, it specifically redirects those measures that directly target site-specific environmental concerns or that target a relevant habitat such as orchards or species rich grassland and that commonly impose more substantial management prescriptions [16].

The deliberate improvement of effectiveness with respect to these two criteria appears to be specifically challenging for large-scale public PES programs such as AEMs in the EU. Thus, questions on how to improve the implementation process have captured the interest of science, recently with a particular focus on one particular actor within the PES facilitating governance structure—the intermediary [17–22]. Intermediaries are defined as those “actors who take on roles that connect and facilitate transactions between buyers and sellers” [20], *i.e.*, players who mediate the exchange between ES beneficiaries or buyers and ES sellers [17,18]. Intermediaries can stem from civil society (being committed individuals or non-governmental organizations) or can be social entrepreneurs, organizations operating between policy and science, governmental entities, *etc.* [17,18]. The potential of intermediaries to improve PES implementation is largely affected by the intermediary’s motives, his or her capacities and competencies (Capacities and competencies refer to an intermediary’s core professional and social skills. An intermediary with skills in agricultural production knowledge can certainly adopt different roles than an intermediary with skills and knowledge in environmental and landscape management.), and his or her roles and responsibilities. Schomers *et al.* [23] consider social networks (social capital)

and trust to be favorable characteristics of intermediaries helping to improve both farmers' participation in and spatial targeting of PES. Social capital in general is created through repeated interactions by individuals spending time and energy working together to achieve certain aims [24,25]. In the context of practical PES implementation, the provision of bonding and bridging social capital is considered to be particularly favorable [23,24]. Bridging social capital predominantly includes the links between individual actors within a social network; bonding social capital focuses on linkages between collective actors and groups [26–29]. Trust is closely related to and often a product that is further reinforced through social capital [26,30]. Farmers do not act in a social vacuum [31,32] but rather react “in concrete ongoing systems of social relations” [33], and their decision-making process regarding PES participation can be influenced by e.g., social capital created in appropriate networks [34].

Correspondingly, intermediaries providing such networks and competencies are, firstly, likely to influence farmers' attitudes and perceptions towards nature conservation and PES as well as their willingness to participate in PES [23,35], which have been identified as important drivers influencing farmers' participation within PES schemes [36–41]. Secondly, intermediaries providing for well-functioning local networks commonly have access to broader sources of information and can better diffuse information at relatively low costs [26]. Intermediaries with functioning networks have therefore been assumed to exhibit the potential to further improve the environmental effectiveness of PES implementation by providing agri-environmental information and assistance to farmers [23]. The provision of these services before, during, and after PES application processes is generally found to influence farmers' participation positively, not least because it reduces private transaction costs and impacts farmers' attitudes towards PES and willingness to implement PES [36,38,39,42]. Furthermore, if intermediaries provide agri-environmental information and assistance deliberately, it helps to adopt a spatial targeting approach of PES.

The aim of this paper is to assess the importance of intermediaries that provide local social networks and agri-environmental information and assistance in improving the environmental effectiveness of public PES in terms of improved participation and spatial targeting. The paper is organized as follows. Section 2 describes our chosen case study, elaborates on the research questions posed within this paper, and describes the analytical framework used to answer the research questions and derives overall conclusions on the favorable PES involvement of intermediaries. The section also elaborates on how we collected and analyzed the empirical data. Section 3 presents the results of our case study, and Section 4 discusses the results of our case study. Finally, in Section 5, we add to the current PES literature as we derive overall conclusions on how intermediaries can enhance the effectiveness of large-scale governmental PES programs in general—focusing on the importance of social networks and the provision of agri-environmental information and assistance.

## **2. Method**

### *2.1. Case Study Research*

In this paper, we aim to contribute to a better understanding of the roles and involvement of intermediaries supporting the implementation of large-scale governmental PES programs. We adopt a

case study approach and take the German Landcare Associations (LCAs) and the implementation of AEMs in Germany as an example.

German LCAs have been identified as one intermediary with considerable potential for improving the environmental effectiveness of AEMs implementation [23]. LCAs are locally based groups led by professional field managers—they are paid for their ordinary business operations. Generally, LCAs focus on activities fostering species and habitat protection, assist in the conservation of agricultural lands and are often involved in areas of conflict, such as the implementation of the Water Framework Directive or the management of Natura 2000 areas [43]. In this context, they cooperate on a voluntary basis with farmers and public administrations. Daily business operations differ across local groups, with each group having its individual portfolio of activities [44]. LCAs commonly use diverse funds for their financing, including membership fees, public funds from the ELER regulation for landscape management and nature conservation projects, AEMs, private money from the German Impact Mitigation Regulation, *etc.* The latter funding source is, in particular, important for LCAs in Eastern Germany [45]. The provision of agri-environmental advice and assistance to farmers on AEMs in the form of advisory service is mostly not covered within their usual business operations [43,45]. LCAs are organized as charitable non-profit and non-governmental organizations that are committed to preserve and maintain the environment and landscape (as defined within their articles of associations). LCAs often provide a collaborative approach towards the implementation of nature conservation activities [44], and have therefore been designated in the German Federal Nature Conservation Act as a preferred organization to commission with the active implementation of nature conservation and landscape protection [23,45]. Most local LCAs exhibit a membership structure that is based on the obligatory and formal integration of local agricultural stakeholders (*i.e.*, farmers, shepherds, land managers, land owners *etc.*), local municipal stakeholders (mayor, local administration *etc.*) and local nature conservation stakeholders (*i.e.*, nature conservation groups, environmental organizations, individuals with a conservation interest *etc.*) in the group's committee. This threefold membership structure has been developed purposefully, as it promises to decrease conflict by resolving tensions and harmonizing contradictory interests between stakeholder groups. It is commonly considered to improve the acceptance of nature conservation [43,45,46], provide for social capital in terms of networks between stakeholder groups, and generate local knowledge on ecological and social circumstances [23].

We chose LCAs as our case study as these, first, are mostly committed actors at the local level. Their involvement in the context of species and habitat protection provides for certain practice-based exchange between the conflicting stakeholder groups. In this context, practice-based refers to the regular exchange between these different stakeholder groups on the ground. We consider that this exchange provides for bonding social capital in terms of a vibrant and practice-based local network between the diverse interest groups (going beyond obligatory and formal membership structures and annual committee meetings). In contrast to the obligatory membership structure, this network is, however, not necessarily provided for by all LCAs.

Second, we consider that bridging social capital is expressed in the frequency of farmers contacting local LCAs on their own initiative, in particular with concerns regarding nature conservation and AEMs, *i.e.*, the network between the intermediary and farmer. In addition, we consider that the LCAs' practical involvement combined with their clearly defined motive and mandate of preserving and maintaining the landscape and environment helps them to be known in the region and to be perceived as a competent

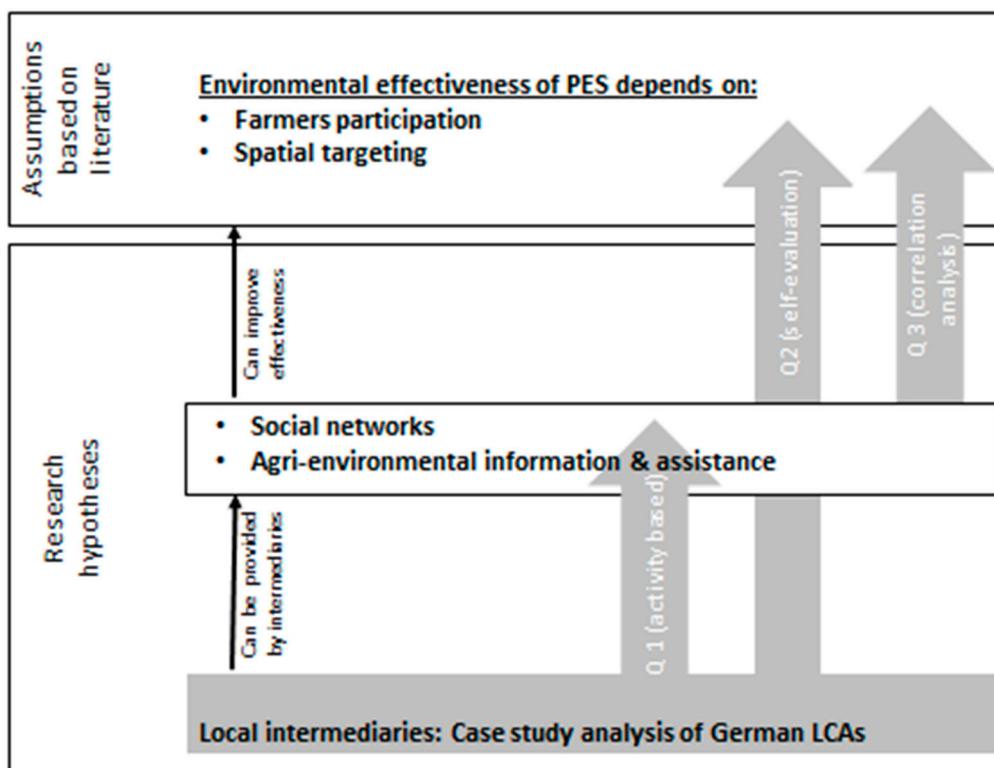
expert in the field of nature conservation and AEMs, both independently and compared to other actors. It is, in particular, an organization's perceived mandate that helps to create relational trust towards farmers [47]. We assume that local LCAs mostly know their region, including the most challenging ecological problems and deficiencies at the local scale, know most farmers, know about the farmers' constraints around AEMs participation and how to convince them to participate, *etc.* We therefore consider LCAs as not only able to provide agri-environmental information and assistance to farmers but also as able to use their local knowledge to broker AEMs to the most important areas and actors.

Within this paper, we focus on three main research questions:

- (Q1) Do local LCAs (a) provide for social networks (both between conflicting interest groups—*i.e.*, bonding social capital; and towards individual farmers—*i.e.*, bridging social capital) and (b) provide for agri-environmental information and assistance to farmers?
- (Q2) Do local LCAs assess their own work (a) as influencing farmers' participation rates in AEMs and (b) as improving the spatial targeting of measures?
- (Q3) Can LCAs' stated relative levels of social networks and their provision of agri-environmental information and assistance be related to their stated influence on farmers' participation in and the spatial targeting of AEMs? In other words, can we find a relationship between LCAs' stated involvement in the context of AEM implementation and their stated influence on the effectiveness of AEMs?

## 2.2. Analytical Framework

To derive overall conclusions on how intermediaries can enhance the environmental effectiveness of PES, we proceed as illustrated in Figure 1. Our assumptions on the determinants of environmental effectiveness (participation and spatial targeting) of PES are—as elaborated above—based on the literature. We consider that these two determinants can be improved through intermediary involvement, in particular, if the intermediary provides for local networks and agri-environmental information and assistance. Indications for such a relationship between intermediary involvement and effectiveness can also be found in the literature and is elaborated in detail in combination with the results of this paper in the discussion. Within our case study, we assess first and in accordance with Q1 how LCAs are currently involved in the context of AEMs implementation. We therefore asked LCAs to state their relative levels of bridging and bonding social networks and their provision of agri-environmental information and assistance. Both variables are operationalized by certain activities; the variables and their respective proxies are explained in detail in Section 2.4.2. Secondly, in accordance with Q2, we asked LCAs to self-evaluate the influence of their overall involvement on farmers' participation in AEMs and to state if they provide for a spatial targeting approach for AEMs. Third, in correspondence with Q3, we verify whether there is a correlation between LCAs' provision of social networks and as well as agri-environmental information and assistance and their stated respective influence on participation and targeting.



**Figure 1.** Analytical framework.

### 2.3. Data Collection

For the data collection, we programmed an online questionnaire and invited all local LCA groups in Germany to participate—thus being a full sample. Contact details for LCAs were obtained via the Landcare umbrella organization the German Association for Landcare (DVL—Deutscher Verband für Landschaftspflege) ([www.lpv.de](http://www.lpv.de)) and from the regional coordination office in the case of Baden Wuerttemberg (In the past few years, new LCAs have been founded in Baden-Wuerttemberg [cf. 40], and not all of them had registered yet with the DVL.). Those LCAs that did not have a valid email address were contacted by phone. We did not reach three local LCAs by either telephone or email, and four LCAs declined to participate when called by phone. Thus, from the total LCA population of  $N = 159$  (cf. Table 1), we invited 152 LCAs to participate. Out of these, 87 LCAs clicked at least the very first page of the questionnaire, and 67 LCAs completed part of the survey. We ultimately received 55 fully completed questionnaires answered by local field managers—only those are included in the following presentation and discussion of the results ( $n = 55$ ). The participation rate is 36.2%. As depicted in Table 1, the response rates across the federal states are comparable; only Saxony is not well represented in the sample. Bavaria and Baden Wuerttemberg hold by far the largest number of local LCAs and exhibit representative response rates.

**Table 1.** LCAs across Germany and survey participation rates.

Federal State	Existing LCAs	Invited LCAs	Participating LCAs	Participation Rate per Federal State
Bavaria	55	52	19	36.5%
Baden-Wuerttemberg	25	25	10	40.0%
North Rhine-Westphalia	15	14	5	35.7%
Saxony	15	14	2	14.3%
Brandenburg	10	10	3	30.0%
Saxony-Anhalt	9	9	3	33.3%
Mecklenburg-Hither Pomerania	7	7	2	28.6%
Thuringa	7	7	4	57.1%
Hesse	6	5	2	40.0%
Schleswig-Holstein	5	4	2	50.0%
Lower Saxony	3	3	2	66.7%
Rhineland-Palatinate	2	2	1	50.0%
Total Germany	159	152	55	36.2%

The survey was programmed using QuestBack EFS-Survey; participants were invited by email and needed to click on a programmed link that directly opened the online questionnaire. The questionnaire was online for six weeks (January 2014–March 2014), and during this period, two reminders were sent out by email.

#### 2.4. Questionnaire

The questionnaire entailed questions regarding LCAs overall involvement in the context of nature conservation at the local scale, *i.e.*, their activities beyond their involvement in AEMs, and questions regarding their specific involvement in the context of AEMs exclusively.

The survey consisted of mostly closed questions with a limited list of predetermined response categories. Each page of the survey provided a comment box in which participants could leave additional information or express concerns if they felt insecure with the response categories. We consider the comments in the results sections of this paper; citations appear in italics and were translated into English by the first author.

##### 2.4.1. Framing of Survey Questions and Limitations of the Data

With respect to nature conservation, there are differences across the individual federal states of Germany. The available nature conservation measures—including AEMs—differ across states. The survey was framed in a general manner to ensure that data are comparable across all LCAs in Germany. The questionnaire asked LCAs to self-assess and evaluate their involvement in the context of AEMs. The data represent the expert knowledge of local LCA field managers, thus providing a good overview of LCAs' actual involvement in the context of AEMs, on the one hand, and their self-estimation of their impact on the other hand. Thus, when considering the conclusions drawn from the results, it is important to bear in mind that only LCAs assessed the influence of their involvement, which could entail certain

bias due to strategic answers and an overrated influence on AEMs. As discussed in the introduction section, involvement in the deliberate provision of agri-environmental information and assistance services are currently not part of the usual business operations for most LCAs [43–45]. We believe that this reduces the risk of strategic answers, as their self-evaluation does not entail the need to perform particularly well in this regard. We consider that LCA field managers are the appropriate responder for the questionnaire and evaluation of the LCAs' work, mostly because the majority of questions cannot be ranked/assessed by others. We address the problem of bias for the relevant variables below and elaborate on the occurrence of strategic answers in combination with the stated results in the discussion section.

#### 2.4.2. Indicators to Operationalize Our Research Questions

To operationalize our research aims, we developed indicators for the quantitative data collection and analysis. The majority of indicators are based on Schomers *et al.* [23]. Table A1 in the Appendix summarizes in detail the various indicators, the respective survey questions and the response categories as well as their transformation into quantitative variables for a statistical data assessment.

##### Q1(a) Provision of Social Networks

Bonding social capital is approximated by the provision of practice-based local networks, *i.e.*, the practical exchange between the diverse stakeholder groups on the ground. We asked, “*Do you provide a regular and practical local exchange on the ground and between the diverse stakeholder groups?*” Bridging social capital is assessed by the network between local LCAs and farmers in terms of the frequency with which farmers approach LCAs' with own concerns. We also consider the reason of farmers' approaching LCAs. We therefore asked, “*How often do farmers contact you on their own initiative—and why?*” as well as “*Who do farmers in your region commonly contact with concerns about nature conservation?*” and “*Who do farmers in your region commonly contact with concerns about AEMs?*”

Individual farmers could only state whom they contact individually, whereas LCAs have a broader overview on whom the majority of farmers contact at the aggregate regional level. The last two variables in addition require LCAs to assess whom farmers contact with concerns about AEMs and nature conservation—thus requiring LCAs to evaluate the choice of farmers. The variable thus entails the bias of making a (well-informed) guess about the actions of others.

##### Q1(b) Provision of Agri-Environmental Information and Assistance

To assess the various activities needed for AEMs implementation that can be supported by LCAs, we prepared a document listing all relevant activities. The document was sent iteratively to experts in the field of AEMs implementation by email, with an invitation to verify, revise and complete the listed transactions. Subsequently, an expert workshop was held in Berlin, Germany, in October 2012, with seven participating experts affiliated with an LCA coordination office, the umbrella organization DVL, a private agricultural advice center, a charitable foundation focusing on nature conservation and a research institute. Experts were invited to revise and complement the listed transactions and to identify and discuss which of these activities could be supported by LCAs (see Schomers *et al.* [23] for a more detailed list). Based on the identified activities, the questionnaire asked LCAs to indicate which of the

listed activities they currently support or provide. The single activities are listed in Table A1 in the Appendix. LCAs could indicate their involvement by clicking “yes”, “no”, “we could provide service in the future”, and “not applicable/don’t know” for every single activity. The questions assess LCAs’ current and potential prospective involvement in the facilitation of AEMs. The questions assess certain activities and do not entail normative aspects—we consider the potential for strategic answers to be relatively low for these variables.

#### Q2(a) Influence on Farmers’ Participation

We assess whether LCAs consider their work to influence farmers’ participation in AEMs via indirect and direct participation indicators. Indirect participation indicators assess LCAs’ stated impact on relative changes in farmers’ perceptions towards nature conservation, as this impacts farmers’ attitudes towards nature conservation measures, which in turn impact willingness to implement AEMs. We therefore asked LCAs to rate the following statements on a 5-point Likert scale (strongly disagree and strongly agree as the two endpoints): “*Farmers’ perceptions towards nature conservation commonly improve when cooperating with LCAs*”, “*Farmers’ attitudes towards nature conservation measures commonly improve when cooperating with LCAs*” and “*Farmers’ willingness to implement AEMs on their fields commonly improves when cooperating with LCAs*”. Direct participation indicators assess LCAs’ stated impact on the total number of AEMs contracted for both simple and more complex AEMs contracts. We therefore asked LCAs again to rate on a 5-point Likert scale the statements “*LCAs’ involvement have increased the number of complex, challenging, and cost-intensive AEMs contracts signed*” and “*LCAs’ involvement has increased the number of contracts signed for those AEMs that are relatively easy to monitor*”.

We consider the variables concerning participation to entail the largest risk of bias for two reasons. First, the indirect variables evaluate LCAs’ impact on changes in the cognition of farmers—which is somewhat difficult for LCAs to appreciate as it mainly concerns farmers. However, we feel that LCA field managers should have a sense of their clients, including the impact of their work on their clients.

Second, the variables entail the risk of strategic answers wherein LCAs (purposefully) overestimate their impact on both the indirect and the direct participation variables. We discuss the risk of bias in the discussion.

#### Q2(b) Involvement in Spatial Targeting

We assess LCAs’ involvement in spatial targeting in three directions: targeting schemes to the most relevant areas, targeting schemes to the most relevant actors, and targeting schemes to the most relevant actors to overcome a single-farm approach in order to e.g., alleviate habitat fragmentation or to ensure AEM implementation at the landscape scale (AEMs have traditionally been directed to the individual holdings through contracts with individual farmers [48]. The single-farm approach of AEMs does not encourage the preservation of ecosystems at the landscape level but fosters individual and disconnected actions by individual farmers [49]). We therefore asked LCAs to indicate their involvement by indicating “yes”, “no”, “we could provide service in the future”, or “not applicable/don’t know” for the following statements: “*We broker AEMs in particular to very relevant areas*”, “*We broker AEMs in particular towards the most relevant actors*”, “*We broker AEMs in particular towards the most relevant actors to*

overcome a single-farm approach in order to e.g., alleviate habitat fragmentation or to ensure AEM implementation". The variables assess the LCAs' current and potential prospective involvement in the targeting of AEMs.

### 2.5. Data Analysis

Data analysis was conducted using IBM SPSS 19. We used descriptive statistics to present the current involvement of LCAs as an intermediary for AEMs implementation in terms of their overall level of social networks, their provision of agri-environmental information and assistance as well as their overall impact on farmers' participation and the spatial targeting of measures.

In a second step, we test for the various correlations between social networks and the provision of agri-environmental information and assistance, participation, and spatial targeting. We run correlation analysis between most of the above-mentioned variables. Table A1 in the Appendix displays the values of the variables used for the correlation analysis to answer our research questions. The correlation coefficients presented in the results section of this paper are based on the Kendall Tau-B rank correlation coefficient, which is the most appropriate for smaller samples. We also run the correlations with the Spearman-Rho correlation coefficient. We obtained the same significant cases, however: correlations based on the Spearman-Rho correlation coefficient display slightly higher correlation coefficients than the Kendall Tau-B, which is why we chose to use the Kendall Tau-B. The total population size of our case study is limited ( $n = 159$ ). Although the survey received a very satisfactory and representative response rate ( $n = 55$ ), the total number of cases included in the correlation analysis is at the lower limit for running this type of analysis. The presentation of the correlation coefficient results should therefore be interpreted as tendencies suggesting the importance of social networks and of the provision of agri-environmental information and assistance to participation and spatial targeting.

We also run correlation coefficients between the social network variables and the various services included in the provision of agri-environmental information and assistance to check for potential influences between these variables. The correlation coefficients for these variables are displayed in Table A2 in the Appendix.

## 3. Results

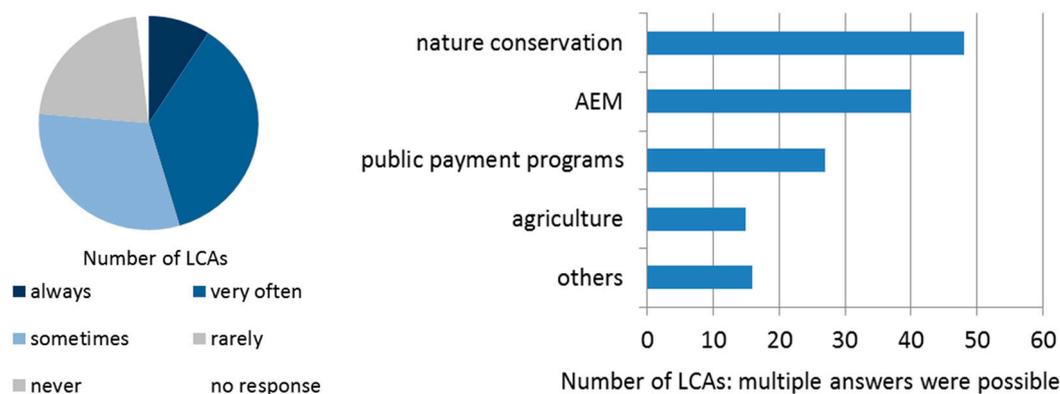
### 3.1. Provision of Social Networks

#### 3.1.1. Practice-based Networks between Stakeholder Groups

Although the formal integration of diverse stakeholder groups in local LCA committees is obligatory, it appears that this does not necessarily foster a regular practice-based exchange between these groups on the ground. A total of 67% of survey participants confirmed that they provided for a practice-based exchange and network between stakeholder groups. However, the frequency of exchange varies considerably across local groups and ranges from an almost daily basis to meetings occurring only once or twice a year.

### 3.1.2. Networks between LCAs and Farmers

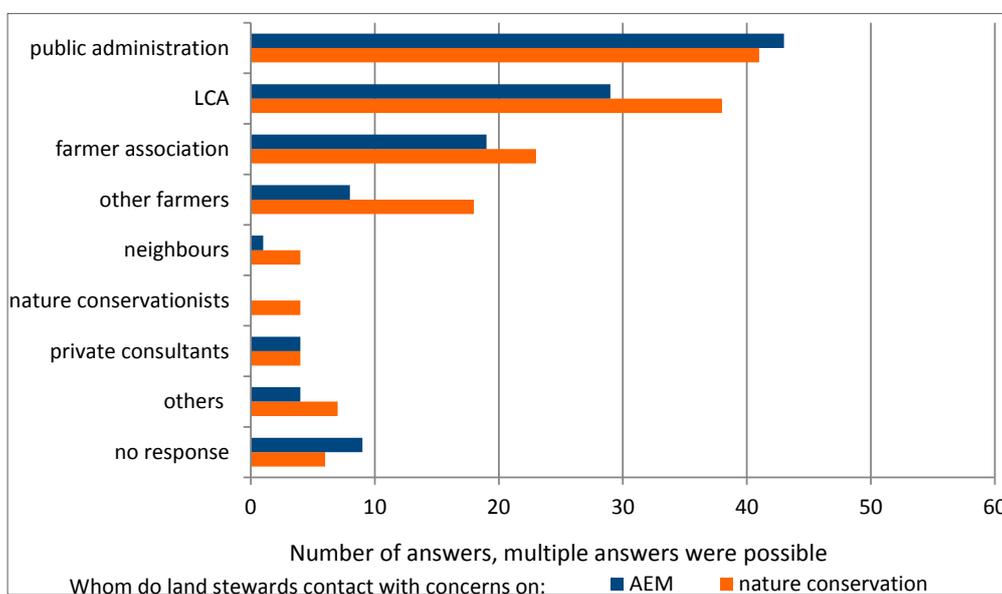
The vast majority of LCAs (76%;  $n = 42$ ) indicate that farmers do contact them either “always”, “very often”, or at least “sometimes”; 22% ( $n = 12$ ) of LCAs stated that they were approached by farmers only “rarely” (Figure 2, left column).



**Figure 2.** Frequency of (left) and reasons why (right) farmers contact local LCAs.

Farmers approach local LCAs for different reasons, but mostly with concerns on nature conservation (87%;  $n = 48$ ) and AEMs (73%;  $n = 40$ ). In addition, concerns about other funding for nature conservation aside from AEMs (51%;  $n = 28$ ) is another relevant reason for contact. LCAs indicate that they are a less relevant contact for farmers with concerns on agricultural issues.

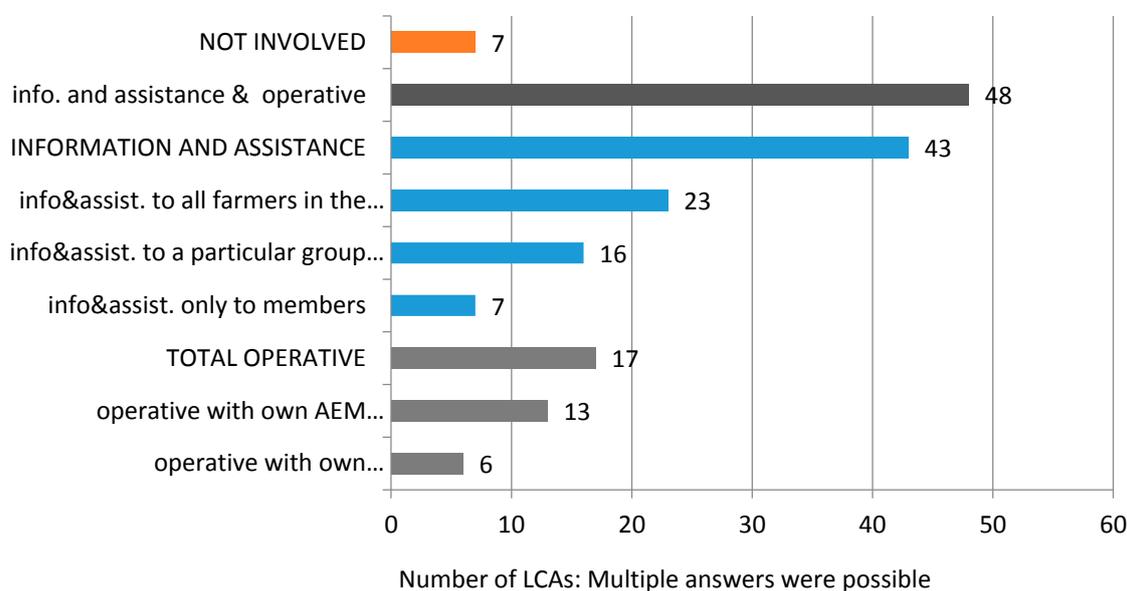
Furthermore, LCAs consider themselves to be important and among the organizations contacted by farmers with concerns about nature conservation and AEMs (Figure 3). The public administration is the most relevant contact for farmers in this area. However, in particular with respect to farmers’ overall concerns about nature conservation, there is only a minimal difference between the public administration and LCAs. Neither private agricultural consultants nor nature conservationists are considered to be relevant contacts for nature conservation and AEMs on behalf of farmers.



**Figure 3.** Whom farmers contact with concerns on nature conservation and AEMs.

### 3.2. Provision of Agri-Environmental Information and Assistance

Not all local LCAs are currently involved in the context of AEMs. However, 87% ( $n = 48$ ) of survey participants indicated involvement in the context of AEMs implementation. Although the provision of agri-environmental information and assistance to farmers is not covered within the daily business operations of most LCAs, the majority of LCAs (78%;  $n = 43$ ) stated that they provide advisory services (information and assistance), whereas 31% ( $n = 17$ ) are involved in an operational manner (Figure 4). Operational LCAs either run their own “Landschaftspflegehof” or have applied for AEMs themselves (A Landschaftspflegehof practically supports environmentally sound management practices within agricultural lands and helps, e.g., to preserve existing culturally formed landscapes by grazing, etc.). Most operational LCAs also provide information and assistance on AEMs. However, the reach of advisory services is limited. Many LCAs offer services only to a particular group of farmers (cf. Figure 4—such as, e.g., only to grassland farmers, farmers operating in relevant areas such as Natura 2000 areas, or only members). Furthermore, the variables as displayed in Figure 4 only reveal how LCAs are involved in the context of AEMs. It does not show how often LCAs provide information and assistance services. It appears that many LCAs commented that they provided agri-environmental information and assistance only sporadically and frequently only at the request of individual land stewards – thus reflecting that these services are not within their ordinary activities: “We provide advisory services only sporadically and in line with our ordinary business operations”, “we provide such services only upon demand to those farmers contacting us” (trans. S. Schomers).



**Figure 4.** How LCAs are involved in the context of AEMs.

Table 2 provides a more detailed overview of the separate information and assistance services that LCAs do provide. The listed activities are arranged in chronological order, whereas the first six activities occur before contract signing, the last two activities accrue mostly after contract signing. A basic requirement for LCAs to operate with farmers in the context of AEMs is that farmers know about the existence of the various available measures and funds. However, only half of all LCAs provide such information. LCAs are particularly involved in those activities accruing before contract preparation and

signing (see Table 2). Furthermore, many LCAs state that they will be able to provide information and assistance in the future but do not do so now. Only a minority of LCAs indicate that they are unwilling to provide advisory services in the future—then however in particular for activities occurring with or after contract signing.

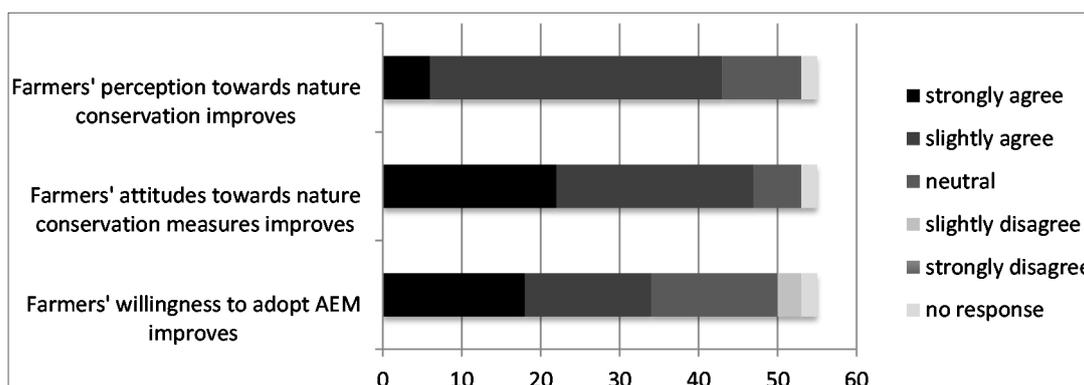
**Table 2.** Number of LCAs providing agri-environmental information and assistance.

Variable	Yes	We could Provide Services in the Future	No	Not Applicable/ Don't know	No Response	Total
Info&assistance AEMs	50.9% (n = 28)	18.2% (n = 10)	3.6% (n = 2)	7.3% (n = 4)	20% (n = 11)	55
Info&assistance eco	69.1% (n = 38)	16.4% (n = 9)	1.8% (n = 1)	5.4% (n = 3)	7.3% (n = 4)	55
Info&assistance content	56.5% (n = 31)	23.6% (n = 13)	3.6% (n = 2)	7.3% (n = 4)	7.3% (n = 5)	55
Info&assistance effort	58.2% (n = 32)	16.4% (n = 9)	9.1% (n = 5)	9.1% (n = 5)	7.3% (n = 4)	55
Info&assistance fields	60.0% (n = 33)	21.8% (n = 12)	9.1% (n = 5)	3.6% (n = 2)	5.5% (n = 3)	55
Info&assistance forms	40.0% (n = 22)	18.2% (n = 10)	25.5% (n = 14)	9.1% (n = 5)	7.3% (n = 4)	55
Info&assistance info	52.7% (n = 29)	12.7% (n = 7)	18.2% (n = 10)	7.4% (n = 4)	9.1% (n = 5)	55
Info&assistance docu	40.0% (n = 22)	16.4% (n = 9)	29.1% (n = 16)	7.2% (n = 4)	7.3% (n = 4)	55

### 3.3. Influence on Farmers' Participation

#### 3.3.1. Indirect Factors

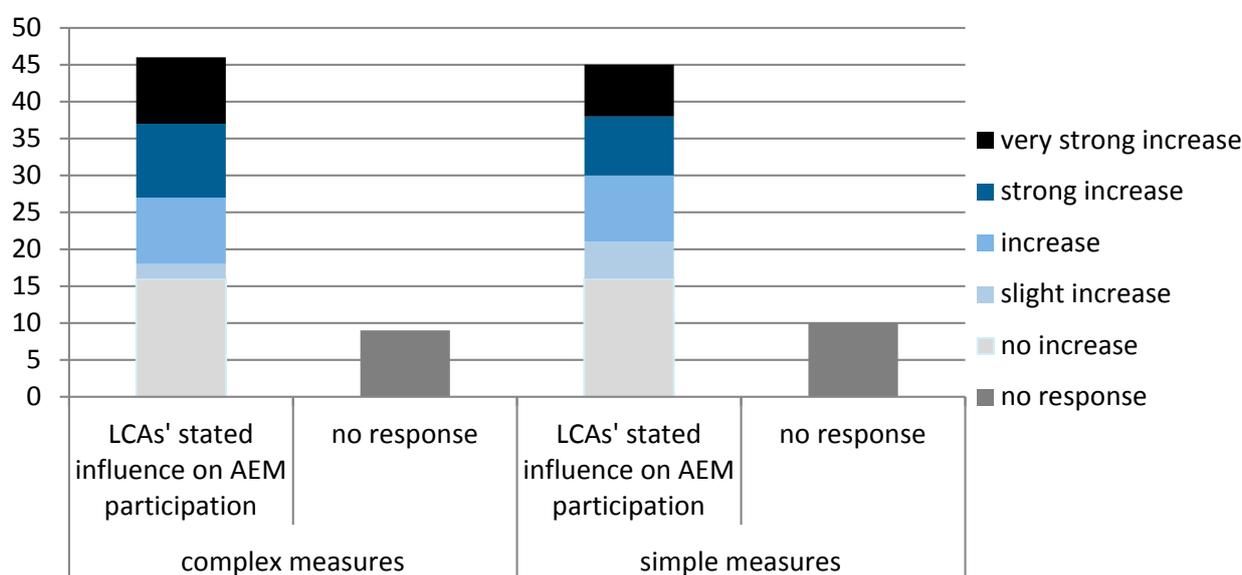
In general, LCAs perceive that their work positively influences farmers' motivation to participate in AEMs (Figure 5). They consider their work to particularly positively influence farmers' attitudes towards nature conservation and farmers' willingness to adopt AEMs. However, the 'perception towards nature conservation' as well as the 'attitudes towards nature conservation measures' variables do not exhibit a large variation in their values, *i.e.*, approx. 78% (n = 43) and 85% (n = 47) of LCAs mentioned having at least a slight positive impact.



**Figure 5.** LCAs' stated influence on farmers' indirect participation drivers.

3.3.2. Direct Factors

A bit more than half of all LCAs also consider their current local involvement to be a positive influence on the total number of AEMs contracted for both complex (dark-green; 55%— $n = 30$ ) and the rather simple and less prescriptive (light-green; 53%— $n = 29$ ) measures (Figure 6). However, those LCAs indicating increases in complex AEMs contracts tend to indicate increases in the simple, less prescriptive AEMs contracts as well (the Kendell-Tau-b correlation coefficient between these two variables is 0.789, the Spearman-Rho correlation coefficient is 0.874; both are significant at a 0.01 level). Thus, most LCAs that stated that they positively influence participation rates do not focus on solely complex or simple measures. However, almost one third (29%;  $n = 16$ ) of all LCAs indicate that they have no impact on the total number of LCAs contracted (Figure 6).



**Figure 6.** LCAs' stated influence on farmers' participation in complex and simple AEMs measures.

3.4. Involvement in Spatial Targeting

The majority of LCAs stated that they adopted a spatial targeting approach and brokered AEMs to most relevant areas (62%;  $n = 34$ ). Only 9% of LCAs indicated that they neither do so currently nor anticipate doing so in the future. This finding is in line with the finding that some LCAs do provide advisory services to only a particular group of farmers (*cf.* Figure 4), such as grassland farmers or farmers in specific protected areas—which also indicates a spatial targeting approach.

Currently, 42% of LCAs stated that they brokered AEMs towards the most relevant actors, and 40% brokered AEMs to relevant farmers to overcome the single farm approach and to alleviate habitat fragmentation or to implement the water framework directive. The involvement of LCAs in all three types of spatial targeting of AEMs can be further increased in the future (Table 3).

**Table 3.** LCA involvement in spatial targeting.

Variable	Yes	We could Provide Services in the Future	No	Not Applicable/ Don't Know	No Response	Total
We broker AEMs to relevant areas	61.8% (n = 34)	12.7% (n = 7)	9.1% (n = 5)	1.8% (n = 1)	14.5% (n = 8)	55
We broker AEMs towards most relevant farmers	41.8% (n = 23)	21.8% (n = 12)	18.2% (n = 10)	3.6% (n = 2)	14.5% (n = 8)	55
We broker AEMs towards relevant farmers to overcome single farm approach	40.0% (n = 22)	25.4% (n = 14)	12.4% (n = 7)	9.1% (n = 5)	12.4% (n = 7)	55

### 3.5. The Relation between LCAs' Involvement and Environmental Effectiveness

The correlation analysis (Table 4) displays the relations between the various variables and helps when considering our research questions as stated in the introduction and method section.

#### 3.5.1. The relations between Social Networks and Participation

The upper right edge of Table 4 displays the correlations between LCAs' local networks and the variables indirectly or directly impacting participation. Although the majority of LCAs indicate that they affect farmers' perceptions towards nature conservation and their attitudes towards nature conservation measures (Figure 5), we cannot find a correlation between the social networks and LCAs' stated influence on these two variables (farmers' perceptions and attitudes).

We cannot find a relation between LCAs' overall level of practice-based social networks between the stakeholder groups (bonding social capital) and any of the indirect or direct participation variables. However, the variables assessing the local networks between farmers and LCAs (bridging social capital) appear to be related to LCAs' stated influence on farmers' willingness to adopt AEMs and to the overall number of AEMs contracted. Furthermore, there is also a relation between the relative level of practice-based networks between stakeholders and the network between LCAs and farmers—*i.e.*, between the bonding and bridging social network variables (see Table A2 in the Appendix; Kendall-Tau-b correlation coefficient is 0.309 and sig. is 0.017).

#### 3.5.2. The Relations between Agri-Environmental Information and Assistance and Participation

The lower right edge of Table 4 shows the correlations between the various agri-environmental information and assistance services that LCAs provide and the indirect and direct participation variables. We cannot find a relation between the provision of agri-environmental information and assistance and LCAs' stated influence on farmers' perception of nature conservation or farmers' attitudes towards nature conservation measures. However, the provision of agri-environmental information and assistance is related to the LCAs' stated influence on farmers' willingness to adopt AEMs. Except for the pure information on the existence of AEMs, it is specifically the provision of information and assistance *ex ante* to contract signing that is positively related to farmers' willingness.

**Table 4.** Correlation analysis; relation between networks & agri-environmental information and assistance and participation & targeting.

Variable	Participation (Indirect and Direct Influence Factors)					Targeting			
	Farmers' Perception Nature Conservation	Farmers' Attitudes Nature Conservation Measures	Farmers' willingness AEMs	Complex AEMs Contracts	Simple AEMs Contracts	Targeting Areas	Targeting Actors	Targeting Habitat Fragmentation	
Social Networks	Networks between stakeholder	0.118 (n = 50)	-0.033 (n = 52)	0.025 (n = 52)	0.024 (n = 31)	0.192 (n = 32)	0.205 (n = 45)	-0.052 (n = 44)	0.000 (n = 42)
	Network LCA & farmer	0.150 (n = 52)	0.188 (n = 53)	0.428 *** (n = 53)	0.351 ** (n = 32)	0.487 *** (n = 33)	0.295 ** (n = 46)	0.195 (n = 45)	0.104 (n = 43)
	Network LCA & farmer for AEMs	0.133 (n = 53)	0.187 (n = 53)	0.458 *** (n = 53)	0.425 *** (n = 32)	0.456 *** (n = 33)	0.131 (n = 46)	0.012 (n = 45)	-0.097 (n = 43)
	Network LCA & farmer for concerns on nature conservation	0.212 (n = 53)	0.152 (n = 53)	0.477 *** (n = 53)	0.337 ** (n = 32)	0.343 ** (n = 33)	0.378 ** (n = 46)	0.154 (n = 45)	0.114 (n = 43)
Agri-environmental information and advice	Info & assistance AEMs	0.011 (n = 39)	0.116 (n = 38)	0.038 (n = 38)	-0.025 (n = 23)	0.250 (n = 23)	-0.047 (n = 33)	0.086 (n = 33)	0.072 (n = 31)
	Info & assistance eco	-0.119 (n = 45)	0.298 * (n = 47)	0.294 ** (n = 47)	0.063 (n = 30)	0.066 (n = 31)	0.497 *** (n = 41)	0.228 (n = 41)	0.175 (n = 39)
	Info & assistance content	-0.088 (n = 45)	0.033 (n = 46)	0.268 * (n = 46)	0.206 (n = 29)	0.168 (n = 30)	0.345 ** (n = 41)	0.348 ** (n = 41)	0.198 (n = 39)
	Info & assistance effort	-0.092 (n = 45)	0.126 (n = 46)	0.371 *** (n = 46)	0.118 (n = 28)	0.161 (n = 29)	0.582 *** (n = 42)	0.378 ** (n = 42)	0.231 (n = 40)
	Info & assistance fields	0.004 (n = 49)	-0.037 (n = 50)	0.247 * (n = 50)	0.276 * (n = 30)	0.310 * (n = 31)	0.636 *** (n = 44)	0.554 *** (n = 43)	0.418 *** (n = 41)
	Info & assistance forms	-0.077 (n = 45)	0.074 (n = 46)	0.329 ** (n = 46)	0.121 (n = 30)	0.158 (n = 30)	0.422 *** (n = 42)	0.396 ** (n = 43)	0.250 (n = 40)
	Info & assistance info	0.083 (n = 45)	0.132 (n = 46)	0.173 (n = 46)	0.049 (n = 29)	0.082 (n = 30)	0.686 *** (n = 42)	0.437 *** (n = 41)	0.340 ** (n = 39)
	Info & assistance docu	-0.198 (n = 47)	-0.224 (n = 47)	0.059 (n = 47)	0.092 (n = 29)	0.067 (n = 30)	0.333 ** (n = 43)	0.402 *** (n = 43)	0.275 * (n = 41)

Significance level = \*\*\* 0.01, \*\* 0.05 \* 0.1; (n = ) displays number of valid cases included in the correlation analysis.

We also find a weak relation between the provision of agri-environmental information and assistance and the network between LCA and farmers, in particular in terms of contacting for AEMs (ranging from 0.237 to 0.475; see Table A2 in the Appendix).

### 3.5.3. The relations between Social Networks and Spatial Targeting

We cannot find a clear and significant relation between LCAs' local networks or perceived competency in nature conservation and AEMs and their pursued spatial targeting activities (upper left edge of Table 4), except for the correlation between the targeting of AEMs to most important areas and two of the networks between farmers and LCA variables.

### 3.5.4. The Relations between Agri-Environmental Information and Assistance and Spatial Targeting

It appears that there is a relation between the stated provision of agri-environmental information and assistance and the spatial targeting variables, in particular, targeting to the most relevant areas. Except for simple information on the existence of AEMs, most correlation coefficients between these variables are statistically significant (lower left edge of Table 4).

## 4. Discussion

### 4.1. Provision of Social Networks and Agri-Environmental Assistance

The results show that the majority of LCAs consider themselves to be providing functioning local networks, in particular, networks between local farmers and the local LCA manager. Most LCAs stated that they were contacted by farmers at least every now and then, in particular with concerns on nature conservation and AEMs. According to the LCAs, only the public administration appears to be more important for farmers' with concerns about nature conservation and AEMs. We consider the stated answers as being realistic for different reasons. First, compared to the other literature, LCAs appear to underrate their importance compared to the public administration. Prager [44] mentions that "*conflicts between farming and public conservation interests were one reason for establishing [LCAs] initially*"—with high levels of mistrust between farmers and public agencies being common. LCAs helped to improve this situation. Comparable results have been published by Schomers *et al.* [23]. However, the legally binding AEMs contracts are signed between farmers and public administration—thus, the overall importance of the agency is not surprising.

Second, the distribution of responses regarding the frequency with which farmers contact LCAs exhibits sufficient heterogeneity—unless many LCAs indicate that they are contacted "always" or "very often". Still, 53% of LCAs stated that they were approached only "sometimes" or "rarely," thus stating rather low levels of social networks. In addition, the reasons that farmers approach LCAs appear to be in line with their business operations—focusing on nature conservation and not on overall agricultural concerns [23,43–45,50]. This indicates that LCAs are perceived and contacted in accordance with their official mandate – being a key driver for the creation of relational trust [47]. These findings could be interpreted as indicating that the majority of local LCAs consider themselves to be a known and mostly accepted intermediary in the context of nature conservation and AEMs, exhibiting relational trust towards their farmers and underlining LCAs' overall fit in the provision of agri-environmental

information and assistance. Their clear standing for nature conservation qualifies in particular for the provision of targeted advice with a clear focus on ecosystem functions and biodiversity. In this way, LCAs' stimulus can clearly be differentiated from e.g., private consultants, who were appraised as being rather unimportant for both farmers with concerns on nature conservation and AEMs. Private consultants often rather provide production centered agricultural advice. Agri-environmental advice can be differentiated from the provision of pure agricultural advice as the latter focuses mostly on improving overall commodity production practices and potentially adversely affects the environmental effectiveness of AEMs [47,51,52]. Therefore, agricultural advice should also cover agri-environmental concerns [47,53], not least because sustainable farming practices as prescribed by AEMs require skills and knowledge [54]. However, intermediaries with a clear environmental mandate and which are not perceived as neutral or even pro-agriculture are often at a disadvantage in creating relational trust, as opposed to e.g., private consultants [47]. However, clearly focused agri-environmental intermediaries need to understand the farmers' (economic) perspective and their constraints, in particular because the adoption of measures is voluntary and LCAs can mainly convince farmers by highlighting the (economic) benefits [23]. The emphasized disadvantage of generating relational trust towards farmers for actors with a clear mandate for nature conservation appears to be overcome at least partially by LCAs, as indicated by the frequency with which farmers contact them. This conclusion is also supported by research on comparable organizations at an international level, such as the Farming and Wildlife Advisory Group (FWAG) in the UK [47].

The findings on the frequency of and reasons for farmers contacting LCAs also indicate that there is a need for organizations to provide information services on AEMs and nature conservation, *i.e.*, that there is currently a deficiency in the provision of such services. Interestingly, the plain provision of information on the existence and availability of AEMs funds appears to be less important than assistance with most subsequent and more substantial AEMs implementation activities. This indicates that most likely, the majority of farmers know about AEMs and that intermediaries providing assistance should be involved in more time intensive and knowledge specific activities.

The reasons why LCAs are currently not providing these services have not been covered within this study. We consider that the limited provision of advice is at least partially provoked by LCAs' internal transaction costs. These transaction costs arise with the provision of advice and are not always adequately compensated. However, the provision of information and assistance reduces farmers' private transaction costs and thereby the total costs of participation [55,56] and is thus considered to trigger participation. Within the last CAP rounds, advice was considered to be an important component to tackle the increasing ecological challenges within the agrarian landscape (see, e.g., Regulation (EU) 1305/2015 [57]). Many urge for more advice and assistance services, which are however restricted due to limited financial resources.

Further, the high relevancy of the public administration for farmers' with concerns about nature conservation and AEMs might indicate that services such as agri-environmental information and assistance could also be provided by government agencies that operate at the local level, manage to provide sound networks including relational trust towards their farmers, and maintain sufficient local ecological and social knowledge. It is not the charitable status of an organization that produces trust, but rather the organizations' perceived mandate [47]. Thus, public agents may not necessarily be at a disadvantage in creating good relations with individual farmers.

#### 4.2. The Influence on Participation and Targeting

The majority of LCAs consider that their work improves both the indirect and direct participation variables. LCAs particularly consider their work to be influencing farmers' perceptions and attitudes towards nature conservation and nature conservation measures; these are the variables with the highest level of affirmation. Farmers' perceptions and attitudes are important drivers in the decision-making process for whether to participate [36,39,41,58,59]. On the one hand, the results as stated by LCAs could indicate that the pure presence of LCAs and their local involvement in the region almost always impacts farmers' perceptions of nature conservation and their attitudes towards the respective measures. On the other hand, the low variation in the two variables' values (perception and attitudes) could also indicate that these entail a bias in the form of strategic answers—thus overrating LCAs' impact on these two very cognitive variables. The emphasized potential of highly strategic answers and thus biased data cannot be ruled out. However, we consider this set of data to be sufficiently realistic to show interesting tendencies and to derive overall conclusions on the importance of social networks and agri-environmental information and assistance for participation and targeting for three reasons. First, LCAs self-appraisal of the indirect and direct participation variables is supported by findings from others on comparable organizations. Prager [44] highlights LCAs' contribution to awareness-raising and changing mindsets, also for production-oriented farmers—a result that Prager also emphasizes for the Dutch counterpart of LCAs. Landcare in Australia has also been credited with improving farmers' attitudes and increasing adoption of conservation measures [60–62]. The same holds true for the FWAG in the UK [40]. Second, the variables “farmers' willingness to adopt AEMs improves” and the two direct participation variables (“complex AEMs contracts” and “simple AEMs contracts”) exhibit heterogeneity in the response distribution. A total of 35% of all respondents indicate neutrality or even disagree slightly with the statement that LCAs improve farmers' willingness to adopt AEMs; further, almost one third of all respondents also state that LCAs do not influence the overall level of AEMs contracted. Third, the correlation analysis exhibits significant relations only for the latter three variables (willingness to adopt AEMs and the two direct participation variables). Thus, we refrain from deriving conclusions on LCAs and their influence on these two indirect participation variables (perceptions and attitudes).

The majority of LCAs also indicate that they currently are or prospectively will be able to perform spatial targeting of AEMs. This indicates that most local groups have the relevant ecological and social knowhow regarding the local circumstances required for such activities. It also indicates that LCAs consider themselves as being able to communicate and convince farmers to adopt the relevant measures. Prager [49] notes that LCAs are well suited to foster a cooperative AEMs implementation approach. In practice, however, it appears that the majority of LCAs do not target AEMs to overcome a single-farm approach, which often requires less cooperation among farmers and less facilitation efforts on behalf of LCAs than a cooperative AEMs approach. Compared to the provision of information and assistance, considerable potential for improving the spatial targeting of measures is currently not used and could be levered in the future. Hence, there is scope for LCAs to further increase their involvement in the facilitation of AEMs in the future. More research is needed to understand how to help them increase their involvement in this regard.

### 4.3. The Importance of Providing Social Networks and Agri-Environmental Information and Assistance for Participation and Targeting

#### 4.3.1. The Importance of Agri-Environmental Information and Assistance

Our results indicate that the deliberate provision of agri-environmental information and assistance impacts on farmers' willingness to adopt AEMs (the first two indirect participation variables). In particular, assistance with the more specific time- and knowledge-intensive activities occurring *ex ante* and with contract signing are correlated to farmers' willingness to adopt AEMs—whereas, the pure provision of information on AEMs is not related to the farmers' willingness to adopt variables. This finding is also in line with other literature. Information and assistance encourages farmers' willingness to adopt AEMs mainly because private transaction costs are reduced [36,40,55,63]. Private transaction costs arise, in particular, up until the point when the final signature is due, *i.e.*, for private information gathering and bargaining and decision-making processes [7]. However, although the provision of information and advice is positively correlated to farmers' willingness to adopt AEMs (indirect participation variable), we cannot find that such service provision can be related to the overall number of AEMs contracted (the direct participation variables). This is a striking result and against most other findings in the literature which cite that access to information and connection to agency or local networks are important drivers for the adoption of conservation measures [35,52,64]. Those LCAs indicating that they provide agri-environmental information and assistance did not reveal the intensity (frequency) of service provision. Many commented that they provide information very sporadically and upon demand from individual farmers—the current overall impact on participation might therefore be minimal in many cases. However, the missing relation between information and assistance and the direct participation variables could indicate something else. While information and assistance improves farmers' willingness to adopt AEMs, it does not necessarily result in more contracts signed. Although for some farmers, the adoption of conservation practices is based on altruistic motives or lifestyle goals [41], this is not the case for the all farmers [58]. A farmer's decision to participate in conservation measures is generally the outcome of “complex interactions of social and cultural as well as economic and policy influences” [59]. The improved willingness to participate could be undermined if relevant factors in the external environment oppose this willingness. Such factors could be too low payment levels, inadequate or inflexible contract terms, too much bureaucracy, high transaction costs, *etc.* [36,55,58,65], ultimately averting participation.

However, most of the agri-environmental information and assistance variables exhibit moderate to strong and significant correlations with all spatial targeting variables. This finding indicates that those LCAs that currently adopt a spatial targeting approach commonly also provide information and assistance—in particular towards farmers in most important areas. Again, the pure provision of information on the existence of AEMs is not related to any of these variables. We interpret these findings as indicating that is, in particular, the time- and knowledge-intensive AEMs implementation activities (such as providing information on the effort and time needed to implement measures or selecting the most suitable fields that will be managed in accordance with AEMs) that are currently supported by LCAs to manage a deliberate brokering of AEMs, *i.e.*, to achieve the spatial targeting of measures. The

importance of agri-environmental advice for successfully achieving the spatial targeting of AEMs is also found by Meyer *et al.* [66].

#### 4.3.2. The Importance of Social Networks

Interestingly, and compared to the provision of agri-environmental information and advice, the variables that proxy LCAs' relative levels of social networks exhibit more and higher correlations with the participation variables (willingness to adopt AEMs as well as complex and simple AEMs contracts). This finding suggests that it is not only about the provision of agri-environmental information and assistance but also about who provides the services. Next to the provision of agri-environmental information and assistance, intermediaries should therefore also invest in the generation and maintenance of social networks and relational trust with their clients—this inference is also supported in the literature [26,47]. The correlations between the information and assistance variables and the (bridging) social network variables (*cf.* also Appendix) indicate that advice and networks might reinforce each other. On the one hand, the provision of advice clearly provides for contact with farmers—in particular, as farmers mostly approach LCAs with concerns on AEMs and nature conservation. On the other hand, the existence of social networks enables LCAs to provide information and assistance at relatively lower costs and can thus be a driver for the provision of advisory services [23,44,64].

However, the local and practice-based network between the diverse stakeholder groups (bonding social capital) does not appear to be relevant for improving farmers' participation in AEMs. This result is noticeable, as the formal membership structure was built purposefully as a lever to improve the acceptance of nature conservation in general [43,45,46]. Local LCA “groups provide a forum for negotiation and conflict resolution where stakeholders with diverse interests cooperate as equal partners”, leading to a “broader acceptance of environmental concerns and coordinated action to ensure outcomes” [46]. This conflict resolution potential is likely to improve acceptance of nature conservation measures in areas with high levels of conflict, such as in, e.g., Natura 2000 areas [43]. Furthermore, it is assumed that these groups produce knowledge related to local ecological and social circumstances [23]. However, the practice-based exchange between the diverse and often conflicting interest groups appears to be almost irrelevant to individual farmers in the context of AEM facilitation. This finding underlines the importance of the local individual field manager, his contacts with farmers and his soft skills - hence, the local embeddedness of the field manager in terms of relational trust and bridging social capital. In the literature, this type of local embeddedness has particularly been emphasized as being important in the context of AEMs and nature conservation measures in general [17,18,47]. Compton and Beeton [24] also found that in the case of the Australian Landcare, it is also the local field facilitator and his respective levels of bridging social capital that determines whether Landcare can be considered a “positive phenomenon”. In this context, a major advantage of LCAs is their broad spatial coverage [23] and their mostly long-term existence and involvement at the local scale [45]. According to Sutherland *et al.* [47], longevity in expertise in the provision of agri-environmental information and assistance is more important than the charitable status of an intermediary in engendering trust. However, to make local groups resilient against external shocks and to clearly ensure their commitment and involvement in nature conservation, continuous organizational support that includes funding for local groups should be considered [45,67]. According to Prager [67], the institutional funding of local groups to ensure local

landscape management and nature conservation involvement is preferable and more cost-effective than any ad-hoc funding or project funding.

There is a weak correlation between the bridging and bonding social capital variables (*cf.* Appendix). This could indicate that exchange between the diverse stakeholder groups helps LCAs to become visible and known in the region and creates personal networks between the field manager and farmers. It would therefore have a very indirect impact on farmers' participation. The membership structure is a unique feature of German LCAs, and in particular, the active involvement of nature conservationists is not met by any other group at an international level [45,46]. An indicated irrelevancy of this membership structure for AEMs facilitation may imply considerable opportunities for other intermediaries in addition to LCAs that do not exhibit the organizational membership structure of LCAs but that provide good levels of local social networks, in particular to farmers, and include the relevant local social and ecological expertise.

Except for two cases, the social networks variables are not related to spatial targeting as conducted by LCAs. Because most of the social network variables consider the direction of farmers contacting the local field manager, this finding could indicate that spatial targeting does not occur accidentally. In combination with the discussed findings on the provision of agri-environmental information and advice, this could indicate that a spatial targeting strategy for AEM needs, in particular, the deliberate provision of agri-environmental information and advice.

## 5. Conclusions

Based on the presented and discussed results, overall conclusions on how intermediaries can generally enhance the environmental effectiveness—in terms of overall participation and spatial targeting—of large-scale public PES programs are now derived.

Deficiencies in the current implementation of PES clearly offer the potential to improve the environmental effectiveness of governmental PES. The discussed results indicate that the provision of agri-environmental information and assistance is one building block to improve the effectiveness of AEMs—however, it is also important to consider who provides such services. Locally embedded intermediaries who provide both local social and trustworthy networks and agri-environmental information and assistance should be considered as an active component within PES-implementing governance structures, as they can actively help to improve overall participation rates and the spatial targeting of measures. Local embeddedness refers, on the one hand, to the importance of personal networks based on relational trust between the individual intermediary and the individual farmers. This also requires that the intermediary is recognized, known, and approachable by farmers, in particular with respect to his capacities and competencies in PES and nature conservation issues. The local social network between the intermediary and farmers (bridging social capital) is likely to help influence farmers' cognition and thus the decision-making process regarding participation (the willingness to adopt PES). On the other hand, local embeddedness refers to knowledge about local social and local ecological circumstances and deficiencies. This is, in particular, a prerequisite for the targeting of PES to most relevant areas or for overcoming the single farm approach entailed in many measures. The targeting of measures requires, in particular, the deliberate provision of agri-environmental information and assistance throughout the entire PES application and implementation process. There is

a need to support specifically the more time- and/or knowledge-intensive PES implementation activities—not least as these provoke high private transaction costs. Therefore, it is important that the intermediary has good knowledge of the respective PES measures, the respective ecological aims of the measures, how and where the measures need to be implemented, how to manage the bureaucracy and paperwork of the application, and so on. Our results indicate that—at least in our case study region—there are deficiencies in the provision of agri-environmental information and assistance; thus, there is ample room to improve the environmental effectiveness of such measures.

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### **Author Contributions**

The authors jointly designed the manuscript, including the development of the questionnaire. The first author wrote the main part of the manuscript, however all authors contributed. All authors contributed to the content in various discussions.

### **Conflicts of Interest**

The authors declare no conflict of interest.

## Appendix

Table A1. Operationalization of research questions.

Indicator	Survey Questions	Response Categories	Value (Correlation Analysis)
<b>Social networks and perceived competency</b>			
Practice-based networks between stakeholders	“Do you provide a regular and practical local exchange on the ground and between the diverse stakeholder groups?” ... and “if so, how often do you foster such an exchange annually?”	yes, no open answer	0, 1
Network LCA & farmer	“How often do farmers contact you on own initiative?” ... and “why?”	always, very often, sometimes, rarely, never, not specified nature conservation, AEM, payment programs apart from AEM, others	Always = 4 Very often = 3 Sometimes = 2 Rarely = 1 Never = 0 Others not included in correlation analysis
LCAs’ perceived competency for nature conservation	“Whom do farmers in your region commonly contact with concerns on nature conservation?”	public administration, LCA, farmer association, other farmers, neighbours,	LCAs mentioned = 1 Otherwise = 0
LCAs’ perceived competency for AEM	“Whom do farmers in your region commonly contact with concerns on AEM and why?”	public administration, LCA, farmer association, other farmers, neighbours,	LCAs mentioned = 1 Otherwise = 0
<b>Components of agri-environmental information and assistance</b>			
Info & assistance AEM	“We inform farmers on the existence of AEM including availability of funds”	yes, we could provide service in the future, no, not applicable/don’t know	Yes = 1 In future or no = 0 Others not included in correlation analysis
Info & assistance eco	“We inform farmers on the pursued ecological goal and explain why measures are important”	yes, we could provide service in the future, no, not applicable/don’t know	Yes = 1 In future or no = 0 Others not included in correlation analysis

Table A1. Cont.

Indicator	Survey Questions	Response Categories	Value (Correlation Analysis)
<b>Info &amp; assistance content</b>	<i>“We advise farmers on the content of the measures and explain how measures need to be implemented on own farm”</i>	<i>yes, we could provide service in the future, no, not applicable/don't know</i>	<i>Yes = 1 In future or no = 0 Others not included in correlation analysis</i>
<b>Info &amp; assistance effort</b>	<i>“We advise farmers on the expected effort and time needed to implement measures”</i>	<i>yes, we could provide service in the future, no, not applicable/don't know</i>	<i>Yes = 1 In future or no = 0 Others not included in correlation analysis</i>
<b>Info &amp; assistance fields</b>	<i>“We assist in identifying and selecting the most suitable plots and fields that shall be managed in accordance with AEMs on a single farm level”</i>	<i>yes, we could provide service in the future, no, not applicable/don't know</i>	<i>Yes = 1 In future or no = 0 Others not included in correlation analysis</i>
<b>Info &amp; assistance forms</b>	<i>“We assist in completing and filling-in the AEM application forms, in particular if these are long and complex”</i>	<i>yes, we could provide service in the future, no, not applicable/don't know</i>	<i>Yes = 1 In future or no = 0 Others not included in correlation analysis</i>
<b>Info &amp; assistance info</b>	<i>“We provide to and obtain for farmers additional and required information throughout the application and implementation process”</i>	<i>yes, we could provide service in the future, no, not applicable/don't know</i>	<i>Yes = 1 In future or no = 0 Others not included in correlation analysis</i>
<b>Info &amp; assistance docu</b>	<i>“We assist farmers with the required documentation and recording of AEM implementation activities”.</i>	<i>yes, we could provide service in the future, no, not applicable/don't know</i>	<i>Yes = 1 In future or no = 0 Others not included in correlation analysis</i>
<b>Participation</b>			
<b>Farmers' perception nature conservation</b>	<i>“Farmers' perception towards nature conservation commonly improves when cooperating with LCAs”</i>	<i>strongly agree, slightly agree, neutral, slightly disagree, strongly disagree</i>	<i>Strongly agree = 2 Slightly agree = 1 Neutral = 0 Slightly disagree = -1 Strongly disagree = -2</i>

Table A1. Cont.

Indicator	Survey Questions	Response Categories	Value (Correlation Analysis)
<b>Farmers' attitudes nature conservation measures</b>	"Farmers' attitudes towards nature conservation measures commonly improve when cooperating with LCAs"	strongly agree, slightly agree, neutral, slightly disagree, strongly disagree	Strongly agree = 2 Slightly agree = 1 Neutral = 0 Slightly disagree = -1 Strongly disagree = -2
<b>Farmers' willingness AEM</b>	"Farmers' willingness to implement AEM on their fields commonly improves when cooperating with LCAs"	strongly agree, slightly agree, neutral, slightly disagree, strongly disagree	Strongly agree = 2 Slightly agree = 1 Neutral = 0 Slightly disagree = -1 Strongly disagree = -2
<b>Complex AEM contracts</b>	"LCAs' involvement has increased the number of complex, challenging, and cost-intensive AEM contracts signed"	strongly agree, slightly agree, neutral, slightly disagree, strongly disagree	Strongly agree = 2 Slightly agree = 1 Neutral = 0 Slightly disagree = -1 Strongly disagree = -2
<b>Simple AEM contracts</b>	"LCAs' involvement has increased the number contacts signed of those AEMs that are relatively easy to implement"	strongly agree, slightly agree, neutral, slightly disagree, strongly disagree	Strongly agree = 2 Slightly agree = 1 Neutral = 0 Slightly disagree = -1 Strongly disagree = -2
<b>Spatial Targeting</b>			
<b>Targeting areas</b>	"We broker AEMs in particular to very relevant areas"	yes, we could provide service in the future, no, not applicable/don't know	Yes = 1 In future or no = 0 Others not included in correlation analysis

Table A1. Cont.

Indicator	Survey Questions	Response Categories	Value (Correlation Analysis)
Targeting actors	“We broker AEMs in particular towards the most relevant actors”	yes, we could provide service in the future, no, not applicable/don't know	Yes = 1 In future or no = 0 Others not included in correlation analysis
		yes, we could provide service in the future, no, not applicable/don't know	Yes = 1 In future or no = 0 Others not included in correlation analysis
Targeting habitat fragmentation	“We broker AEMs in particular towards the most relevant actors to overcome a single-farm approach in order to e.g., alleviate habitat fragmentation or to ensure AEM implementation”	yes, we could provide service in the future, no, not applicable/don't know	Yes = 1 In future or no = 0 Others not included in correlation analysis
		yes, we could provide service in the future, no, not applicable/don't know	Yes = 1 In future or no = 0 Others not included in correlation analysis

Table A2. Correlations between other variables.

	Social Networks				Provision of Agri-environmental Information & Advice							
	Network between stake-holder	Network LCA & farmer	LCAs' competen. nature conservation	LCAs' competen. AEM	Info & assis. AEM	Info & assis. eco	Info & assis. content	Info & assis. effort	Info & assis. fields	Info & assis. forms	Info & assis. info	Info & assis. docu.
Network between stakeholder		0.309 ** (n = 52)	0.250 * (n = 52)									
Networks LCA & farmer	0.309 ** (n = 52)		0.510 *** (n = 54)	0.507 *** (n = 54)		0.254 * (n = 47)	0.268 * (n = 46)	0.310 ** (n = 46)		0.475 *** (n = 46)	0.238 * (n = 46)	0.237 * (n = 47)
LCAs' competency nature conservation	0.250 * (n = 52)	0.510 *** (n = 54)		0.628 *** (n = 55)				0.360 ** (n = 46)	0.305 ** (n = 50)			
LCAs' competency AEM		0.507 *** (n = 54)	0.628 *** (n = 55)			0.324 ** (n = 47)	0.293 ** (n = 46)	0.342 ** (n = 46)		0.401 *** (n = 46)	0.328 ** (n = 46)	0.354 ** (n = 50)

Significance level = \*\*\* 0.01, \*\* 0.05 \* 0.1.

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