TRANSACTION COSTS IN AGRI-ENVIRONMENTAL SCHEMES: THE PRINCIPAL-AGENT-POINT OF VIEW

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Abstract

Agri-environmental schemes provide payments for farmers in return for environmental services. Their implementation induces transaction costs for administration and farmers. Although transaction costs became subject of research in recent years, little attention has been paid to activities which create them. This paper uses insights from Principal-Agent-Theory to show, how information gaps between contracting partners result in tradeoffs inducing activities conducted at implementation level. A Grassland Extensification Scheme, provided in Hesse, Germany, serves as a case-study. The paper shows that attempts and incentives to overcome informational gaps are different for administration and farmer. Further, attempts to reduce transaction costs of own activities may have spillover effects on the transaction costs of the contracting partner and along the transaction process. Those effects should be taken into account in discussions on scheme evaluation and development.

Keywords: Agri-Environmental Schemes, Transaction Costs, Principal-Agent-Theory, Hesse, Germany

JEL Classification: Q18, Q23

Introduction

In the past, agriculture has played an important role in the economy of rural areas, but structural changes like increasing industrialization led to a significant reduction of importance and simultaneously of cultivated land in central Europe and, in particular, in Germany. While food production as a purpose of agriculture became less significant in the eye of the public, concerns with regard to agriculture's environmental impact grew. Agriculture has been recognised as being a provider of multifunctional landscapes, particularly of ecosystem services (Ribaudo et al., 2010). The increasing demand on ecosystem services was taken up by policy: One of the major objectives of the European Union's Common Agricultural Policy (CAP) on rural development is encouraging "farmers and other land managers to serve society as a whole by introducing or continuing to apply agricultural production methods compatible with the protection and improvement of the environment, the landscape and its features, natural resources, the soil and genetic diversity (…)." (European Council, 2005, Art. 35). Agri-Environmental Schemes (AES) serve as 'quasi-market' where governmental agencies act as representatives for consumers. They offer payments to farmers in return for committing to carry out agri-environmental measures above mandatory standards at a voluntary basis. AES provide payments to compensate the production loss of agricultural market commodities, higher production costs and, if necessary, transaction costs. The payments must be calculated merely on cost-compensation base (European Council, 2005, Art. 39). Due to federal task-sharing, German AES are designed and provided by the states (*Länder*, NUTS 2). In Hesse, AES also serve as a policy to fulfil the Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats' Directive, HD).

Implementing AES involves transaction costs (TC), which can be broadly defined as "scheme organisational costs" (Falconer et al., 2001:84). Expending TC is necessary at different stages of the implementation process, either for farmers (private TC) or for the administration (public TC). Along the transaction process, TC are distinguished in: (1) search and information costs to find an adequate transaction partner; (2) bargaining and decision costs if agreements on the terms of transaction are required, and (3) policing, monitoring and enforcement costs to make sure that each contract party complies with the agreement (Dahlman, 1979:148).

The amount of TC borne either by farmer or administration has substantial influence on the success of an AES. Public TCs are subject to discussions on effectiveness, based on the fear of wasting public money. Faced with limited budgets, governments attempt to reduce public TC. In Hesse, reforms of AESs led to payments and contracts with a high degree of standardisation. However, a mere reduction of TCs without weighing against similar losses of possible gains from spending TC may either lead to losses in ecological terms or in increasing attempts to outweigh standardised scheme prescriptions. We can expect individual adjustment attempts by the farmers. Thus, reducing public TCs may lead to an increase in private TCs, or even in an increase in overall TC. Neglecting private TCs may lead to reduced rates of participating and therefore result in reduced ecological outputs.

Although TCs, their influencing factors and the conflicts inducing them became subject of intensified research in recent years, little attention has been paid so far to how these conflicts are actually met, especially at scheme implementation level. In terms of time and resources, the amount of public and private TC is constituted at large by the activities conducted by farmers and administrations. Consequently, the amount of TCs is directly linked to the choice of activities. These serve to overcome information gaps and are intentionally conducted by the actors according to their individual tradeoffs and incentives. As the underlying tradeoffs may differ between farmer and administration, spillover effects might exist between the TCs of one contract partner on the TCs of the other partner, and possibly also along the scheme implementation process as a total.

This paper attempts to shed light on these effects. It uses insights of Principal-Agent-Theory (PA-Theory) to show the actual tradeoffs administrations and farmers have to face. The Site-Specific Grassland Extensification Scheme in Hesse, Germany, serves as a representative case-study for action-oriented programmes[1]. It is shown that tradeoffs and incentives to overcome informational gaps differ for administrations and farmers. The working hypotheses pursued are twofold: Firstly it is assumed, that regulations meet the conflicts described by PA-Theory with respect to meet administrational needs; secondly, that these regulations induce costly activities conducted by both contracting partners which influence their individual TCs mutually and also along the transaction process. Results show, that tradeoffs and incentives to overcome informational gaps differ for administrations and farmers. Furthermore, spending TCs on individual activities is likely to have spillover effects on the activities of the contracting partner and along the transaction process. Those effects should be taken into account in discussions on scheme evaluation and development.

After presenting a literature overview and the methodology, scheme regulations are presented in detail. A description of the theoretical framework follows. In the consecutive section, a detailed analysis of administration's and farmers' tradeoffs is conducted as related to the scheme options. Possible spillover effects occurring due to specific TC spending are delineated. The analysis is followed by a discussion and conclusions with respect to scheme optimizing possibilities.

Literature Review

In recent years, private and public TCs in AES were investigated theoretically and empirically. The most important results show, that TCs have a substantial influence on total scheme costs (e.g. Falconer and Whitby 1999, Falconer et al. 2001, Nilsson 2007), vary scheme specific with the nature of the ecological good concerned (Rørstad et al., 2007), and may amount to over 100% of costs for payments, especially at the stage of initial scheme implementation (Falconer and Saunders, 2002). Public TCs are positively correlated to the number of agreements, the area under agreement and the number of prescriptions, indicating substantial variable cost components. TCs are negatively related to scheme duration, which indicates a share of initial fix costs (Falconer et al., 2001). Private TCs decrease with the number of AES implemented on the farm and with the number of ha under contract,

[1] Action-oriented payments are linked to an adapted agricultural management that is presumed to lead to the production of environmental goods. Contrary, result-oriented payments are directly linked to the desired environmental goals in terms of environmental goods. For example, a farmer may receive payments for a 'species-rich wet meadow' (Matzdorf and Lorenz, 2010:535).

also indicating a fix cost component (Mettepenningen and van Huylenbroeck, 2009). Further, a positive relationship exists between scheme effectiveness, i.e. to environmental benefits and the amount of TC to be borne (Falconer et al., 2001, Vatn, 2002).

Although these results have added significantly to the understanding on factors influencing TCs in AES, little attention has so far been spent on *how* TCs are actually spent in scheme implementation. Interrelations and possible spillover effects between the single trade-offs, which occur along the steps of the transaction process, have been theoretically reasoned (e.g. Mettepenningen and van Huylenbroeck, 2009), but they have not been yet investigated with respect to practical implications in terms of amount and distribution of TCs.

Material and Methods

The paper provides a theoretical framework on how to empirically investigate the impact of activities resulting in TCs (public and private) on policy implementation level. This is done by a case-study analysis at regional level. Conflicts and resulting tradeoffs, stemming from a contractual relationship, and their main influencing factors are derived from literature, using insights from Transaction Cost Theory, Principal-Agent-Theory and Information Economics. We analyze how those tradeoffs are actually met and show the impact by a positive analysis of the AES regulation and other related public documents provided by the state of Hesse. The theoretical reasoning is supplemented by results of expert interviews and preliminary frequency results of a pilot study on farmers' TCs in Hesse: 29 face-to-face interviews were conducted with a randomly selected sample of farmers participating in the Grassland Extensification Scheme. We used a standardised questionnaire to calculate the amount of TCs and to identify the composition as well as influencing factors of TCs borne on participating in the scheme. Questions concerned the time and activities spent on information gathering, bargaining and scheme implementation. Further, questions on the individual management agreements, site specifics, opportunity costs of participating, farm characteristics, business ratios and socio-economic items were asked.

The Site-Specific Grassland Extensification Scheme

Political frame

Hesse is one of the largest states of Germany, located in the centre, with a size of 21.000 km^2 and inhabited by 6 M. people. In 2007, agricultural and silvi-cultural area covered 42% and 40% of total area. 21,126 farms exist, one third of them is run fulltime and covers 783,905 ha (HMULV, 2008). 63% of the total agricultural land is arable and 36% are permanent grasslands (HMULV, 2006). Agricultural structure and main utilization varies strongly among the Hessian counties. Grasslands are mainly found in the low mountain ranges of Eastern and Central Hesse, while arable land predominates in the South. Compared to the national average farm size, Hessian farms are smaller with respect to land and herd size. Due to structural change, the number of farms is continually decreasing, especially in the mountainous areas with area of low marginal productivity. Closing down of cattle farms in such areas, but also intensification to increase yield in productive areas lead to a loss of grassland, which in turn cause the loss of environmental and ecological benefits like water pollution control, erosion and habitat protection. AES on grassland protection were established to secure the typical small section land use and to prevent land from abandonment (HMULV, 2006).

Since 2007, all Hessian AES (i.e. Ecological Farming, Implementing Buffer Strips or Site-Specific Grassland Extensification) are implemented under the framework of HIAP (Hessisches Integriertes Agrarumweltprogramm, Hessian integrated agri-environmental programme). Every AES is based on a management contract between farmer and a county agricultural administration (in the following: *administration*). A share of 48% of the CAP-Pillar-2-Budget in Hesse is provided for HIAP. Its intended scope is about 153,000 ha. Shares of 50% of the total scheme costs are covered by CAP, the remaining 50% are raised mainly by the State of Hesse and partly by national funding. The Grassland Extensification Scheme takes the largest share of the budget, as well as the highest intended number of participants (35,000 ha and 9,000 participants) (HMULV, 2006). It is a follow-up of previous schemes, in which the former site-specific landscape pertaining programme was fused with

non-site-specific extensification programmes; a number of clients were taken over. With the introduction of the follow-up, the farmers formerly participating in the site-specific scheme had to accept almost the same standard of prescriptions, but received 30% less in payments.

Scheme Details

Aim of the investigated scheme is to preserve ecologically valuable grassland habitats (HMULV, 2006). Priority is given to habitats specified by the EU-Habitats' Directive, but area eligible can also be protected by nature protection laws, as long as it is approved being ecologically valuable. Grassland specified by HD covers about 41,000 ha in Hesse.

The contract period is five years. Contract terms include basic prescriptions as prohibition of grassland conversion, of using chemical or synthetic pesticides, and of surface irrigation or melioration. Organic fertilisation may be allowed upon application if under-nutrification occurs. Farmers are obliged to use the contracted area agriculturally, at least once per year; a second use (mowing or grazing) may be compulsory due to habitat characteristics. Farmers can choose between a grazing or a mowing agreement. The main obligation in the mowing agreement is the prescription of a fixed date for first mowing (usually not before the 1st of June up to 1st of July), and the removal of the swath. The main obligation in the grazing agreement is a prescribed cattle density of at least 0,3 livestock units/ha[2], and often a prescribed (comparatively late) date for first grazing and often additional mowing. The calculation of payments, paid for each type of agreement, is based on estimated opportunity costs for participating farmers (HMULV, 2006). The basic annual payment is 110 €/ha for the mowing agreement and 200 €/ha for the grazing agreement. If the contract area is located in a nature protection area, the farmer is paid an individually calculated payment up to 200€/ha, according to the legal-based use restrictions. Besides, further compensation payments ("ecologically valuable special services", EVSS) can be agreed upon, which are based on presumed extra effort due to specificities of the contracted area, like slope, wetness or difficult accessibility. Basic and extra payment for EVSS is calculated as an average compensation needed for losses in income and extra costs. Additional compensation for EVSS is provided in steps of 25/50/75€/ha/year. A total payment of 360€/ha/year must not be exceeded. The exact payment is not part of the contract, as the actual payment is carried out only if the annual budget at the administrations' disposal is large enough. Double funding is strictly prohibited, e.g. farmers participating in the organic farming scheme only receive the difference between the extensification and the organic scheme payment for contracted plots.

Including further area into an ongoing contract is not possible. In case of operative changes, a further contract has to be concluded. Thus, farmers can have several contracts in the programme which have different runtimes.

Theoretical Framework for Analysis

TCs were firstly described by (Coase, 1937) to explain the choice of different governance modes at executing different transactions. Later definitions range from a broader view, as the "costs of running the economic system" Arrow, 1969:1) to a more focused perception of being "the cost of exchanging ownership titles" (Demsetz, 1968: 35). Demsetz also states that that "it is possible to increase or decrease this cost by a more or less inclusive definition of which activities are to be counted as transaction activities" (Demsetz, 1968: 35). In a technical approach, Williamson, 1985:1f.) refines the nature of TCs as the costs of frictions, which occur when a transaction – i.e. when "a good or service is transferred across a technologically separable interface" – takes place[3].

[2] An upper limit for cattle density was firstly prescribed but skipped in the last regulation revision.

[3] To distinguish TC from administration costs as the costs of public production, the distinction by Arrow (1969:12) seems helpful: "The distinction between TC and production costs is that the former can be varied by a change in the mode of resource allocation, while the latter depend only on the technology and tastes, and would be the same in all economic systems". The administrative costs examined are spent due to the contractual nature of the transaction. Consequently, they can be referred to as TC.

This paper interprets TC according to the reasoning of Dahlman (1979:148). He focuses on the origin of TCs as "resource losses incurred due to imperfect information". Withdrawing the assumption of complete information in market transactions, he argues that a possible equilibrium is transaction-cost-constrained. This implies the necessity to spend costs on information (Dahlman, 1979:144, 148). As reaching a market equilibrium is not static, but part of a process, he argues (following Coase, 1960), that all TCs (search and information costs, - as ex-ante costs-, bargaining and decision costs, policing and enforcement costs - as ex-post costs) "owe their existence to imperfect information" (Dahlman, 1979:148) and should be taken into account in the contract partners' price and quantity reasoning.

The effect of adding TC to the supply (S) and demand curve (D) are illustrated in Fig. 1:

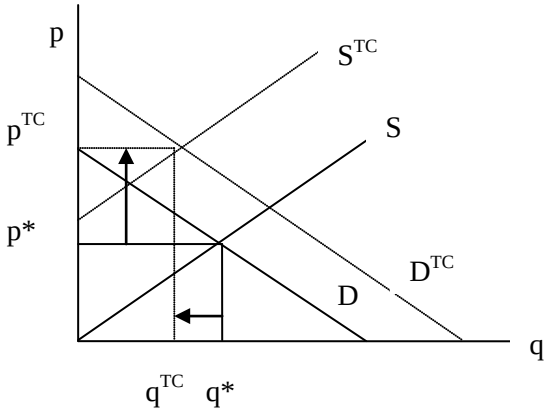

Fig. 1: Effects of TC on price and market outcome

Adding TC leads to a leftward shift of S to S^{TC}, and a rightward shift of D to D^{TC}. This induces a price increase from p* to p^{TC} and a loss in outcome q*- q^{TC}.

The extent of this distortion is influenced by the possibility of opportunistic behaviour of the trading partners (Williamson, 1985). Distortional effects stemming from informational advantages on behalf of one contract partner are discussed in PA-Theory, which focuses on the conflicts occurring from a contractual relationship between a customer (principal) and a contractor (agent). The agent is supposed to have private information which enables him to opportunistic behaviour, i.e. generating an extra rent (Laffont and Tirole, 1993). AES contracts are service contracts, as farmers are paid for fulfilling a specified task by the principal, i.e. to comply with the management agreements to produce the environmental good. Therefore, the administration is taking the role of the principal. The farmer-agent has several information advantages: Firstly, he has farm-specific information, the administration can not be sure that the offered payment meets the production costs of the environmental good. If the payment is too low, farmers would not participate, as their participation constraint is not met. If the payment is too high, the farmer generates a rent from the difference between cost and compensation. (Moxey et al., 1999) show, that in a two-type-farm model with a high and a low productive type, only second best solutions are possible under asymmetric information. This results in deviance from the social optimum and possible rent generation for the low productive farmer. Fixed-price contracts offer additional rent-seeking possibilities: As the farmer is residual claimant of any cost savings, he has a strong impact for cost reduction which enlarges the rent already possible (Laffont and Tirole, 1993). This problem is referred to as *adverse selection*, as the principal faces the risk to mandate an improper agent. So, ex ante spending of TC is necessary to gain information on farmers' productivity to design contracts which limit those misleading incentives (Ferraro, 2008).

Problems resulting from information gaps after the contract is concluded are referred to as *moral hazard* (Laffont and Tirole, 1993). The principal cannot monitor the agent's actions completely. The agent may claim on exogenous circumstances which hampered his contract fulfilling, despite of his own decision not to comply. In case of prearranged payments, the agent may generate an extra rent

due to the difference of his costs (effort) and the height of the payment. So, monitoring costs must be spent to check the farmers' compliance.

Both problems lead to an inefficient outcome of the contract, i.e. to a distortion of the optimal allocation (Laffont and Tirole, 1993, Bolton and Dewatripont, 2005). They have been examined in theoretical models of AES with respect to adverse selection (Fraser, 1995, Moxey et al., 1999, Canton et al., 2009) and moral hazard (Choe and Fraser, 1998, Ozanne et al., 2001, Fraser, 2002, Yano and Blandford, 2008). Theoretical findings show that rent generation is possible for farmers ex-ante and ex-post contract conclusion, leading to a loss of public money due to allocative distortions and high TCs. In AES, these distortions lead to a misallocation of subsidies and probably to a loss in eligible land.

Combining Dahlman's definition of TCs with the additional problem of allocative distortions modelled by PA-Theory, TC can be perceived as costs intentionally spent on activities to close informational gaps. They serve to minimize allocative distortions. TCs can be spent in different ways, i.e. on different activities. The next section will show on what reasoning the actual spending on TCs takes place. We argue that decisions on how to spend TC induce reverse effects.

Figure 2 illustrates these considerations.

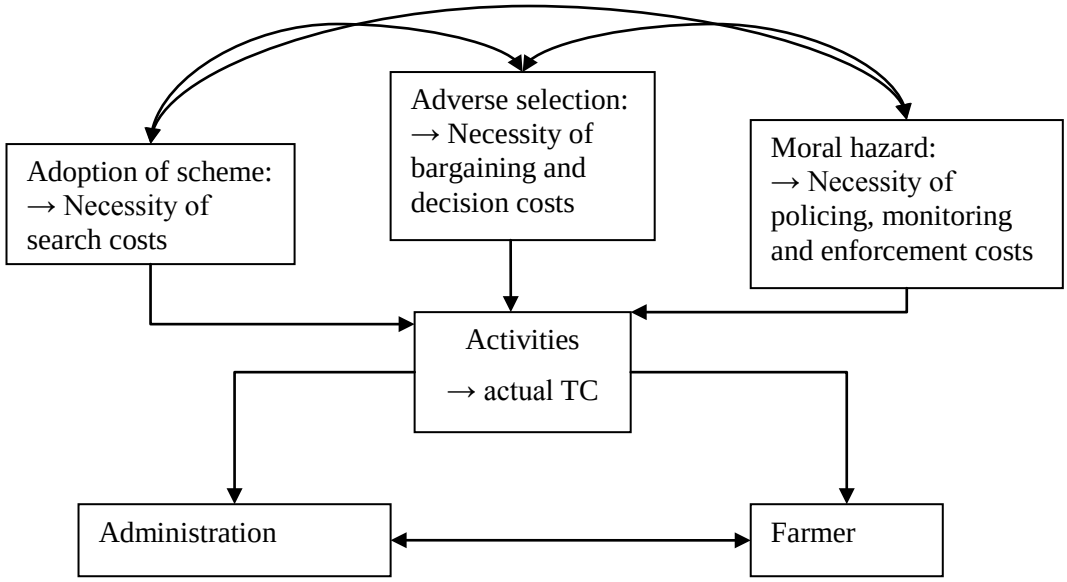

Fig. 2: Possible linkages of tradeoffs and activity-based TC spending between farmer and administration

Tradeoffs and TC-Influencing Factors in the Implementation of the Current Scheme

Search and Information Costs

The administration is obliged to preserve the grassland sites secured by the HD. It has to identify farmers managing secured area, to inform them that secured plots are eligible to the scheme, and provide financial incentives to encourage farmers to participate. This recruitment is costly. In our case study, the administration has an obligation of result. Thus, the direction of search can be assumed from administration to farmer, i.e. the demand side looks for a supplier by providing information on possible trading opportunities. Consequently, it can be assumed that the administration bears a higher share of the total search costs. On the other side, a rationale for farmers to look actively for funding possibilities and bear a part of the search costs is the intention to maximise their income. They are in need to get information on funding possibilities. This need is the higher, the more limited the farmers'

income possibilities are due to production disadvantages. Farmers can only make contracts with the administration. So, their search focus on the scheme options the administration offers.

Search costs are positively related to the *duration* of search, but *decreasing marginal gains from search* can be assumed due to an initial scope of price or quality dispersion of the demanded good (Stigler, 1961:215). The higher the search costs, the lesser the gains from the selection process, if this gain is fix (Arrow, 1996:122). Information Economics assumes that a consumer expends on search as long as he expects benefits from search; i.e. gains from a better quality/price ratio of the requested good or service (Stigler, 1961). In theory, the optimal amount of search would be realized where the marginal costs of search equal its marginal return, i.e an optimal matching (Stigler, 1961:216).

The amount of search costs is generally determined firstly by the *quality or other characteristics of items available for transaction* (Dahlman, 1979:148). In our case, the item of transaction is the 'site under contract', i.e. a specified participation in the scheme. To identify site characteristics, information on several dimensions is needed: Scientific knowledge on quality, on the incidence of habitats and their ownership, and on preservation management (practices) (Wätzold and Schwerdtner, 2005:331). These can be subsumed as "site-specifics".

Secondly, search costs depend on *possible transaction opportunities* (Dahlman, 1979:148), i.e. the number of potential partners. This number is given by the number of farmers managing area under the HD. As the number of farmers is known, search costs for first contacts are mainly determined by the dispersion of the farmers among Hesse. The more disaggregated (in terms of regionality) a search is, the more targeted the selected contract partners are with respect to reducing informational rents (Canton et al., 2009). Contacting and contracting are assigned to the county, so costs depend on the dispersion within one county, which varies significantly due to its individual agricultural structure.

Finally, search costs are influenced by the price at which the service is offered (Dahlman, 1979:148). The higher the offered payment, the more farmers are willing to participate, which influences the number of trading opportunities and their willingness to bear information costs. The price at which the farmers can supply the service should depend on their individual production costs, which are subject to the particular production function of the farm. However, farmers may also revalue the circumstances at which they contract. Knowledge on such "farm-specifics" is needed to calculate the payment (Wätzold and Schwerdtner, 2005:331). Information costs on farm-specifics depend on the heterogeneity of the production functions of the farms. The less heterogeneous they are, the easier it is to calculate a payment which compensates the production costs of a majority of farmers. Thus, information on the production costs appears as a prerequisite for the calculation of an appropriate payment. Although this informational gap may be considered a search cost, it is investigated here as a bargaining cost.

Bargaining and Decision Costs

The need for spending on bargaining and decision making is theoretically explained by the problem of adverse selection and consequent rent-generation. Bargaining can make farm-specific information available for the administration, as the farmers are forced to reveal their effort up to a certain degree. Thus, it can reduce possible rents of the farmers, but is itself costly (Moxey et al., 1999). The possible improvement (in terms of rent-avoiding) in the agreement reached has to be weighed against the costs of lengthening the bargaining process (Fraser, 1995:23). Bargaining costs can thus either be interpreted as the costs of rent circumvention (Bolton and Dewatripont, 2005:94) or a time consuming process itself. Formulated as an optimization problem, the marginal costs of bargaining should equal its marginal gains, i.e. the reduction of distortion; to be efficiently spent. Consequently, bargaining costs should be related to the *extension of the possible rent*, i.e. the range between compensation payment and true costs borne by the farmer. This range depends on the possible spread between true production costs and compensation payment which is influenced not only by farm-specifics but also by the natural setting of the farm.

Costs of bargaining should be borne by both contract parties: From the administrations' point of view, bargaining is an activity to reduce possible rent distortions and achieve the politically set scope.

From the farmers' point of view, bargaining is an action undertaken to maximise the possible funding. His initial activities on bargaining are (1) to calculate, which conditions make scheme participation profitable, (2) to estimate potential production losses, (3) to identify a threshold for scheme participating, and (4) to elicit the plots to be contracted possibly to request permission of the proprietor. Thus knowing his individual production function, bargaining gives him the opportunity to conclude on a higher level of management agreements and on further compensation payments instead of only concluding on the basic payment.

Policing, Monitoring and Enforcement Costs

Policing, monitoring and enforcement are necessary to meet the problem of moral hazard (Ozanne et al., 2001). In AES, those costs evolve due to a prevailing logic of opportunities to cheat and incentives not to comply with the agreements (Choe and Fraser, 1998). Farmers make their decisions whether to comply or not using the economic optimization calculus of weighing the probable costs of non-compliance against its probable gains (Becker, 1968). Farmers could maximise their expected income by not complying with the agreements, in extreme by realizing their full market income and receiving the compensation payment (Wätzold and Schwerdtner, 2005). Their decision depends on the degree to which it is possible to cheat without being detected and punished. Farmers not only have an incentive to cheat, if the marginal gains from cheating are larger or equal to the costs of cheating, i.e. the punishment. The gains are given by the non-restricted market income, which depends on the production function of the farmer, and market conditions plus the full compensation payment. The costs of non-compliance are influenced by the extent of the possible sanctions, but also by the probability of being detected and the degree of risk-aversion of the farmers (Ozanne et al., 2001). Due to German Law, sanction payments can not be imposed prohibitively high. The probability of being detected is dependent on the frequency of monitoring activities and their depth, but not on the degree of non-compliance, and therefore increasing with additional monitoring activities, which implies additional costs (Ozanne et al., 2001). The administration has to meet this trade-off by adequate deterrence. Complete disclosure of cheating is prohibitively costly. So, the administration has to meet the trade-off between the costs of deterring and its potential gains, i.e the achieving of the ecological aim (Becker, 1968).

This reasoning imposes, that TCs on monitoring should be borne by both contract partners, although the distribution between the contract partners may depend on the plausibility of non-compliance with respect to the individual farmer. Intuitively argued, the lower the incentive for cheating, the less their share of monitoring costs should be. The willingness to comply is determined by the farmer's degree of risk aversion, by the costs of non-compliance which are determined by the expected sanctioning and the probability of being detected. However, measuring risk aversion of farmers is difficult. Fraser (2002) interprets risk aversion as risks in management (i.e. failures): The higher their risk of production, i.e. the more uncertain their market income is, the more they are willing to comply with the agreement. Also normative and social attitudes, like a feeling for a "duty for compliance" or the fear of social sanctioning may influence risk aversion (Winter and May, 2001).

Results – Activities of Contract Partners and Possible Spillover

Search and Information Costs

In Hesse, site-specific information is given by the geographical and ecological provision of occurrence on habitats secured by the HD. Knowledge on management practices is provided by broad scientific literature and mission-oriented research, often publicly funded e.g. in research programmes of universities (e.g. Reiter and Schmidt et al., 2004). It can be assumed that the administration has a given state of knowledge about the demanded good in general, and that the base of knowledge is currently increasing. However, quality differences may exist between habitat types with respect to their ecological value and between the plots within one habitat type.

Costs to identify possible contract farmers are borne by the administration; they provide information to farmers on AES options either by events, handouts, advertising or personal contact. In Hesse, search for scheme participants is conducted on county level. Information on the terms of the scheme is provided via brochures sent to farmers and information meetings in locations close to the

farmers. Additionally, information can be gathered in face-to-face meetings. Preliminary empirical findings show, that 83% of the interviewed farmers read at least once a brochure provided by the administration, 69% had attended an informational meeting of the administration, 55% made at least one personal telephone call to the administration, and 49 % had at minimum one face-to face meeting at the administration. Further important information resources for farmers are magazines (69%) and talks to other farmers (52%). Information gathering via internet and meetings with other counsellors were only conducted by a small number of farmers (both 14%). The average time farmers spent on information gathering activities is 9 hours, with a range from 0.25 hrs to 30 hrs.

Interpreting these results from an information economics' point of view, information provided by the administration is rather general. So, it is limited in referring to the needs of individual farmers. This goes in line with economic reasoning to standardise search for participators to keep public search cost at a low level. This attempt influences farmer TC as well: As their search focuses on scheme options, this general information given seems to be insufficient for them. To get individual information, the farmer is obliged to contact the administration. This induces a greater share and amount of farmers', but also of public TC, when the administration is concerned, e.g. in personal contacts.

The decision on how to conduct search also affects TCs at later stages of scheme implementation. The more specifically the information is given to possible contracting farmers, the less mistakes farmers might make at applying or implementing. This could lead to the prevention of administration costs of control and correcting costs. Also, individual information on farm-specifics could lead to less bargaining effort, as contract payment could be reached at an early stage of bargaining.

Search costs borne by the administration are fix to a large degree. Once knowledge on site-specific issues is gained, it can be stored. Thus, spending TCs on information and knowledge can be regarded as initial fix investment decreasing over time or spatial scope. Also, once a transaction partner has been identified, he can be addressed again in each contract cycle. The same effect arises from previous participation. It can be assumed to have an effect on the costs per contract, as costs can be assumed to be decreasing from one contract to the next, as the information on site-specifics and possible contract partners can be assumed to be used for further contracts (Mettepenningen and van Huylenbroeck, 2009).

Bargaining and Decision Costs

Hesse offers a county-wide payment with only little additional bargaining possibilities. Hereby, the administration reveals the need to depart from standardisation. However, the calculation of the payment is carried out due to national references (BMELV, 2009:84ff). Calculations base on average assumptions on the service/cost ratio using data on average farm production. The basic payment offered in Hesse is below the cap given by the national regulation. The calculation of compensation payment for EVSS is provided by the Hesse State Office for Agriculture (LLH) and accounts for additional technical efforts, special charges and production losses (HMULV, 2006:274), also basing on average assumptions. If actual costs exceed the cap, they are not compensated.

As the payment serves as a compensation of average production costs, its adequacy firstly depends on the underlying distribution of farmers' production functions, i.e. their *heterogeneity* and the deviance from the national representative farm: The higher this gap and range, the higher the possibility of rent-obtaining. Because agricultural land use and utilization focus in Hesse vary strongly among its regions, rents in terms of overcompensation occur most likely. Secondly, the production costs vary according to the number and complexity of the management agreements, which attempt to meet ecological site-specific needs. The more agreements, the higher production costs can be assumed, especially if the integration of AES-agreements into daily farm business is complex. From the administration's point of view, bargaining would lower the rent only if a farmer would be overcompensated by the basic payment, but this rent would be eroded by additional agreements where the additional compensation is below his additional production costs. In all other settings, bargaining would improve the rent possibilities for the farmer. However, answers from farmers of the pilot study revealed, that only 41% of farmers think that the offered payment meets their actual production costs,

52% answered, that they feel undercompensated but participate in the scheme to have their actual costs compensated a little. Thus, bargaining on additional agreements seems to be perceived by farmers as necessity and not as deceitful action. If bargaining is not successful from the farmers' point of view, they may try to adjust necessary management activities downwards on a level compensated by the payment. This would lead to potential losses in ecological outputs.

Standardized payments, offered by the administration, seem to increase bargaining activities on the side of the farmers. Most activities conducted by the farmers were calculating production costs (52%) and selection of contract plots (48%). 73% of the farmers had at least one meeting for bargaining with the administration, 55% at least one phone call. The average time spent on bargaining activities is 6 hours (ranging from 0 to 29 hrs.). Those activities increase their own bargaining costs as well as the costs of the administration, if bargaining activities involve both parties.

Policing, Monitoring and Enforcement Costs

The scheme regulations provide several control activities: First, the administration has to register the data on practices and plots given by the farmers into the relevant software. At this first point of formal control, the correctness of data about the plots and is checked to prevent them from double-funding. The data is sent in by the county administration to the state-wide operating and payment agency and run through a multi-stage procedure where regulation and budget compliance are checked. The scope of this off-site control is 100%. Then, the payment according to the individual contract details is calculated. The preliminary contract is transferred to the state-wide operative and paying agency. If no corrections have to be done (which would lead to re-consignment to the county), the agency controls the compliance with budget regulations. After necessary corrections, the contract is officially set up and sent back to the administration. There, the contracts are printed out and sent back to the farmers. The contract is formally recognized when it has been signed by the farmer. The duration for farmers to fill in the application lasted from 0 (in some cases the administration filled in answers) to 4 hrs, with a medium of about one hour. 76% of the farmers reported that they deliver the contract personally to the administration, spending also time to discuss final details. 35% of the interviewed farmers reported timely efforts on returns of the application due to mistakes in the application.

Off-site control contains yearly checking the field logs, in which farmers have to keep documenting their compliance. In the pilot study, farmers reported timely efforts in documenting activities with a mean of 66 hrs (ranging from 0.25 hrs to 380 hrs) over the whole contract period of five years[4]. The payments are paid annually only upon application, including a signed statement of compliance with the agreements. This induces also efforts for the administration in controlling, passing and authorizing the payment. Farmers report, that the payments are often late (in the following or even next-but–one year).

On-site monitoring is carried out at 5% of all participating farmers randomly selected. Selection of the farms to be visited is done by the state-wide operative agency and control measures (field visits and satellite pictures) are partly executed by the agency and the administration. They also induce sanctions in case of breaches. As these monitoring activities are executed by different administrative authorities; they have to communicate in order to adjust their activities. This also induces costs, mostly in terms of idle time and time lags. If contract breaches are discovered, measures of sanctioning have to be carried out. Farmers have only efforts at on-site control, when breaches occur. Farmers reported that 37% of monitored breaches occurred due to data mistakes and 25% due to non-fulfilling the management agreements. A high share of reports on breaches (37%) was wrong due to monitoring mistakes by the administration.

Farmers face calculable costs of non-compliance: In case of being detected, the payment is cut off up to 100% depending on the severity of deception. Wrongly obtained payments must be paid back. A

[4] The costs of one year of documentation were multiplied with 5 (contract period).

temporary exclusion from all AES is also possible, but no further penalty payments are intended. The probability of being detected results from the frequency and the depth of control measures.

The amount of policing and corresponding monitoring costs may be influenced by the previously borne costs on information and bargaining. Trust resulting from a long time partnership might reduce monitoring costs. However, the administration is obliged to follow the EU-wide prescriptions on monitoring scope and activities, as it is itself a reporting agency for executing EU-measures, so a reduction in monitoring effort seems to be difficult. But possibly, the amount of breaches can be reduced by spending more on information. This especially refers to the part of breaches relying on incorrect data given by the farmers. These breaches cover more than on third of monitored breaches in the pilot study. Also, the monitoring activities conducted by the administration seem to be error-prone, inducing costs for administration and farmer to be abolished.

Discussion

The given structure of regulation and implementation seems to induce "unnecessary" TCs for both contract partners. The previous results show, that linkages of TCs spent by each contract partner exist, and may lead to spillover effects on the amount of TCs. Regulations provide incentives for farmers to meet the initially "take-or-leave" contract by utilizing all possibilities to enlarge their payments. This has countervailing effects on the gains obtained by preceded standardisation. Those reversing effects are not only given to bargaining situations, but also at the stage of policing.

The strictness of the regulations is in consequence of the strict cost-compensation requirement given by the EU consistently implemented and controlled in Hesse. Distortions through adverse selection are met by rather tightly calculated payments. Policing and monitoring regulations are only set up due to the problem of moral hazard. However, several dilemmas result as a consequence of designing the regulations only to curb rent-generating possibilities of farmers, as the actual attempt of farmers on rent-seeking might be less intensive as presumed by the government.

Problems described by PA-Theory seem reasonable when opportunistic behaviour is probable. However, this probability is influenced by the underlying structure of the scheme. Firstly, the relationship between the contracting parties is unbalanced: The administration determines most of the contractual content (like the area eligible, the payment, and the management and policing prescriptions), so farmers have little opportunities to cheat. The administration also enforces the prescriptions by control; respectively has the authority to sanction offenses. On the other hand, fulfilling of its contractual obligations is conditionally, according to its financial possibilities. Since the administration is the only consumer for ecological services provided by farmers, they are trapped in a lock-in situation. Bargaining for farmers is limited to achieve additional payment by EVSS. They may try to adjust the actual contracted management agreements to a level still compensated by the payment, leading to potential losses in ecological outputs. Even if they manage to optimize the payment with respect to their production costs, uncertainty on the payments prevails: Exact payments are not part of the contract. The administration only pays the payments if the budget is sufficient, otherwise, the farmers has to accept reductions. So, bargaining efforts of farmers might not only be pursued due to rent-seeking, but to meet individual production conditions more precisely. The consequence is that ecological criteria become minor elements in the negotiations and the ecological effectiveness might be strongly reduced (Osterburg and Stratmann, 2002). Thus, actual bargaining can be regarded as insufficient. Further bargaining possibilities would surely add to allocative efficiency. Furthermore, farmers having the feeling to be rewarded properly may have more incentives to comply with the contract. Adequate payments could then result in less monitoring effort.

Secondly, the payment calculation is based on assumptions of average production costs and income losses of farmers, but without any regional differentiations. Furthermore, the basic payment is fixed with respect for the type of agreement and does not take the exact scope of management agreements (e.g. number of uses, type of second use etc.) into account. This standardisation shall keep TCs for the administration low, but keeps that of the farmer high. Additions to the payment by agreeing on EVSS are limited by the budget cap. So, the incentive for farmers to participate with

respect to the payment continuously decreases with additional agreements. Feeling undercompensated could lead to extended non-compliance, which would induce additional monitoring and enforcement costs to the administration.

Thirdly, monitoring could be designed more efficiently. Without any knowledge of the risk disposition of the farmer, the sampling of farms to be controlled remains random and possible shirkers could be overlooked. Incentives to non-complying depend on development of markets and prices on the marketed commodities of the farmers, notably in relation to the payment. Thus, the heterogeneity of production functions may provide different incentives for non-compliance. In a high productive agricultural area, these incentives might be higher due to a higher market price/payment-ratio. On the contrary, following Fraser (2002), high variability of market prices for agricultural commodities or production output may keep farmers from non-complying in order to stabilise their expected income. Indicators to indentify risk-averse farmers may be the farm focus with respect to the uncertainty of production outcome, or their subsidy/revenue-ratio reflecting their dependency of subsidies. Fewer incentives for farmers to cheat would be given if the payments would be calculated according to individual production functions. This argument also suggests that more individually calculated payments should prevail. Furthermore, farmers could be exempted from control due to their farm-specifics like no alternative land use possibilities. Knowledge on those farm-specifics could be achieved by intensified bargaining.

Although suggestions on scheme optimizing must take the constraint of cost compensation into account, improvement of actual scheme design is possible: Firstly, information should be provided for farmers more individually. The problem of adverse selection could be met by a payment by production activities: As higher level of management agreements induces more activities, an adequate payment could be reached. Such an approach would meet farm-specifics and site-specifics more easily and facilitate the bargaining process for both contract parties. Further, also adequate payments for farmers with low opportunity costs would be possible. Knowledge of specific management activities on specific habitats is provided either by traditional knowledge of farmers and by scientific research. Farmers could calculate their individual production costs due to their farm-specifics, traceable to the administration. Information costs would probably diminish, as the prescriptions and payments would be transparent and easily to be communicated. Monitoring would be easier, as the management activities undertaken by the farmer are already element of the compulsory field log. Also, the incentives not to comply would be reduced by more adequate payments.

Conclusion

The analysis has shown why information is important in AES implementing, which actual informational gaps exist and how they are met by actual activities of each contract partner. Further, influencing factors on TC were identified and it was shown which spending of TCs might be efficient to reduce informational gaps. It was also shown that spillover effects from one type of TC on another, as well as on TC of the contract partners are likely to exist.

Instead of standardisation attempts, AES-design should rather focus on TC optimizing and taking private TCs and the depicted tradeoffs as well as linkages into account. Thus, TC spillover effects could be used and channelized intentionally to optimize AES.

The findings highlight the need for further empirical investigation to get knowledge on the actual extent of spillover effects.

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