

Auctions in an outcome-based payment scheme to reward ecological services in agriculture – Conception, implementation and results

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Abstract:

This paper presents an outcome-based payment scheme to reward ecological services in agriculture with the focus on the use of auctions. Starting in January 2004 the payment scheme is tested upon its implementation as an agri-environmental program. The intention of the program is to overcome the disadvantages of existing and mostly action-orientated agri-environmental programs. The design of the payment scheme is based on fundamental criteria of market economy such as supply and demand and integrates auctions as an award procedure. Furthermore it is outcome-based and considers the interests of the local people and the relevant stakeholders and their demand for botanical diversity. During the first auction and two surveys of local farmers it is already obvious that this payment scheme is not just a theoretical construct but that it is already practicable in the model-region. The main research is the determination and the evaluation of the farmer's transaction costs to take part in auctions bound in this regional payment scheme.

Keywords:

agri-environmental policy, auctions, ecological services, principle of subsidiarity, transaction costs

JEL-Code: Q 10

1. Introduction

1.1. Fundamental disadvantages of the current agri-environmental policy

Agriculture plays an important role in protecting the botanical diversity of the rural environment. Since the reform of the Common Agricultural Policy (CAP) in 1992, agri-environmental schemes have been supported by the EU within the framework of the second pillar of the CAP. In these programs farmers were rewarded for environmental services. In the context of the current agri-environmental policy, ecological services provided by agriculture are predominantly rewarded action-orientated and imply particular disadvantages both from an ecologic and from an economic point of view (Kleijn and Sutherland, 2003; Wilhelm, 1999). On one hand it implicates substantial regimentations for farmers, so there are no purposeful incentives connected for an innovative and regional differentiated reach of socially desired ecological goals. On the other hand an action-oriented agri-environmental policy with the use of a uniform premium – especially against the background of the necessary examination of agricultural subsidies – faces an economic justification problem. This rightfully, since from the current agri-environmental policy no incentives proceed to an efficient use of limited public funds. Furthermore it is necessary to compare this payment scheme with existing agri-environmental programs. Therefore the farmer's transaction costs to take part in auctions bound in this payment scheme will be ascertained and compared with the farmer's transaction costs of taking part in existing agri-environmental programs in a model-region.

1.2. Goals of the payment scheme

For the solution of the initially described problems and thus for the advancement and improvement of agri-environmental programs, an outcome-based payment scheme to reward ecological services in agriculture was developed.¹ This payment scheme differs fundamentally from the status quo of agri-environmental programs. It is outcome-based, integrates market-similar elements by the use of auctions and is regional embodied with consideration of the EU-principle of subsidiarity. Furthermore it delivers the possibility to

¹ The project is a part of the BIOPLEX-programme. BIOPLEX is an interdisciplinary project investigating the links between biodiversity and spatial complexity in agricultural landscapes at different spatial scales [see: <http://www.uni-giessen.de/bioplex/>]. BIOPLEX is part of the BIOLOG-programme funded by the German BMBF (Federal Ministry of Education and Science). Aim of the programme is to promote research in the context of global change and decreasing biodiversity. BIOPLEX is a collaborative project bringing together working groups from Justus Liebig University Giessen and from Georg-August-University Göttingen.

implicate the participation of the local population's preferences for botanical diversity. From an economics point of view the payment scheme puts a special focus on an efficient achievement of ecological objectives, which are defined as ecological goods (Fischer et al., 2003). In this paper the concept and its components will be described and beyond that, the results of the first auction and two surveys with the focus on the farmer's transaction costs in the model-region will be presented. Finally conclusions will be drawn as far as possible at that time.

2. Transaction Costs

First a brief overview of the development of the transaction cost economics and their theoretical foundation will be given. Since Adam Smith economists have been inspired by the idea, that the price mechanism is able to coordinate the division of labour and trade in a society like an "invisible hand" (Smith, 1776). Almost two centuries later economics did begin to realise, that the working of the price mechanism is costly and that something like transaction costs do exist. In 1937 Ronald Coase started to introduce first conceptual thoughts about transaction costs in his paper "The Nature of the Firm" and build up the historical starting point of the transaction costs economics. He argued that firms should be conceived as entities endogenous to the economic system and whose existence is justified only in the presence of transaction costs to production. Firms and other economic organisations and institutions, in effects, exist because agents find it an useful manner of minimising transaction costs. But he failed to give a more detailed definition of transaction costs and called them simply "the costs of using the price mechanism". The second famous work of Ronald Coase to be mentioned in this context is of course "The Problem of Social Costs" (1960). Coase discusses solutions of the problem of negative externalities. Contrary to Pigou's theory that only governments can "internalise" externalities in economic exchange or production by means of taxes and subsidies (Pigou, 1932), Coase argued that when one considers opportunity costs in its full meaning, no such devices are necessary, because in the absence of transaction costs, the allocation of resources is independent of the distribution of property rights. This connection between transaction costs and property rights became famous as the "Coase Theorem", although Coase never used that term.

Oliver E. Williamson picked up Coase's ideas in early 1970s and started the second body of work on transaction cost economics (e.g. Williamson, 1975, 1979, 1985, 1996, 2000). In

his work “Transaction-Cost Economics: The Governance of Contractual Relations” (Williamson, 1979) he identified the critical dimensions of characterising a transaction and links these to the institutional governance structures of transactions. The three principal dimensions to describe a transaction are, the frequency of exchange, uncertainty and the degree to which investments are transaction-specific. Finally Williamson concludes that non-specific transactions are efficiently organised by markets, while recurrent transaction-specific exchanges could be organised more efficiently governed internally.

In Wallis and North’s 1986 article “Measuring the transaction sector in the American economy, 1870-1970” the first effort to measure economy-wide transaction costs was launched. Wallis and North measured the size of the so called “transaction sector”. They divided the whole economy in two parts, the transaction and the transformation or production sector and measured the total value of resources used in the transaction sector. In this analyse only the transaction costs floating through the market were captured. But the so called non-market transaction costs, such as spending time in waiting, filling out forms, gathering information and so on are critically important to analyse and understand the economy. Research on non-market transaction costs has been accomplished for example by Dajino and Farina (1999), de Soto (1989) or Alexandra and Lee Benham (1998).

Finally the very diverse group of economists dealing with transaction costs in Ecological and Environmental Economics should be mentioned in this context. Here the transaction costs in the working of emission trading and the use of incentive mechanisms in environmental protection in general are focused (Solomon, 1999; Tietenberg, 2002).

Especially through the work of Williamson, the transaction cost economics became one, if not to say the core field of the New Institutional Economics, so named because it provides a theoretical framework and emphasis of testability to the institutional traditions of Commons and Veblen. Williamson therefor is considered the founder of this literature, both in terms of vocabulary and content and also he is one of the strongest proponents of applying the notation of transaction costs. After all, there should be no doubt, that transaction costs do exist and do matter. Despite the voluminous literature in the new institutional economics, a theoretical consensus on what transaction costs are, is still out of sight (e.g. Allen, 1991; Allen, 2000).

According to the diverse theoretical understandings and definitions of transaction costs, it is not surprising, that also for the empirical measurement of farmer's transaction costs of agri-environmental programs, no unique method has been available yet. So, the main questions in the beginning of this research are "What are the relevant transaction costs?" and of course "How to measure the transaction costs?".

Thus in this case the farmer's transaction costs are focused and will be accomplished by using questionnaires to build up an extensive data pool, which finally will be evaluated in a transaction costs study. At that time the transaction costs for making an offer in the first auction are focused. In the course of the research all farmer's transaction costs involved in taking part in this outcome-based payment scheme – like e.g. the monetary valuated time needed to gather information about the auction, to engage an advice, to fill out forms and to calculate prices will be measured.

3. Auctions

Auctions can be defined as "[...] a market institution with an explicit set of rules determining resource allocation and prices on the basis of bids from market participants" (McAfee and McMillian, 1987). The effectiveness of auctions as an allocation mechanisms is theoretical evident and has been well documented in the past. However the use of auctions has a longstanding tradition in government procurement contracting, but has been limited to trade commodities as for example public works, electricity and emission rights. Using auctions to conserve natural resources is a relative new concept. Also in general the exploration and the use of auctions to reward farmers as a part of agri-environmental programs is increasing, but there is still an urgent need for research, before the implementation of auctions especially into the CAP.

Theoretically the potential benefit of auctions in allocating contracts for the provision of non-market or public goods in the countryside is analysed by the auction theory. The two main reasons why auctions are of interests in this case are the following: First, the traded ecological goods are public-type and nonmarket goods which have no standard value and in some kind of way a public demand and valuation is needed. The second reason to be mentioned is the presence of asymmetric informations between the farmers and the administration (Latacz-Lohmann and Van der Hamsvoort, 1997). Farmers know better how

a participation on agri-environmental programs would affect their production and profits. So they will calculate based on their individual costs and a price for the trades goods will emerge. This offers a possibility for a more efficient use of public funds as if the administration would fix a unique premium, not knowing the farmer's costs of production.

Practically auctions already are used for the provision of nonmarket goods in the countryside. Since 1986 the U.S. Department of Agriculture has been awarding land retirement contracts for the Conservation Reserve Program (CRP) based on a competitive bidding mechanism. Farmers make offers to obtain CRP cost share assistance, which is allocated to them based on a so called Environmental Benefit Index. This Environmental Benefit Index incorporates individual scores on six environmental factors, which are wildlife, water quality, erosion, enduring benefits, conservation priority areas and air quality (e.g. Reichelderfer and Boggess, 1988; Plankl, 1999).

In the United Kingdom, embodied in the Conservation Sensitive Stewardship Scheme and the Nitrate Sensitive Areas Scheme, a fix payment is offered to the landowners for specified environmental actions. The administration then chooses landowners who offer the best quality land management plan. In Australia, as another example, auctions are used in areas such as salinity control, nutrient control and conservation of existing vegetation where land use change is required to achieve environmental improvement (Stoneham et al., 2002).

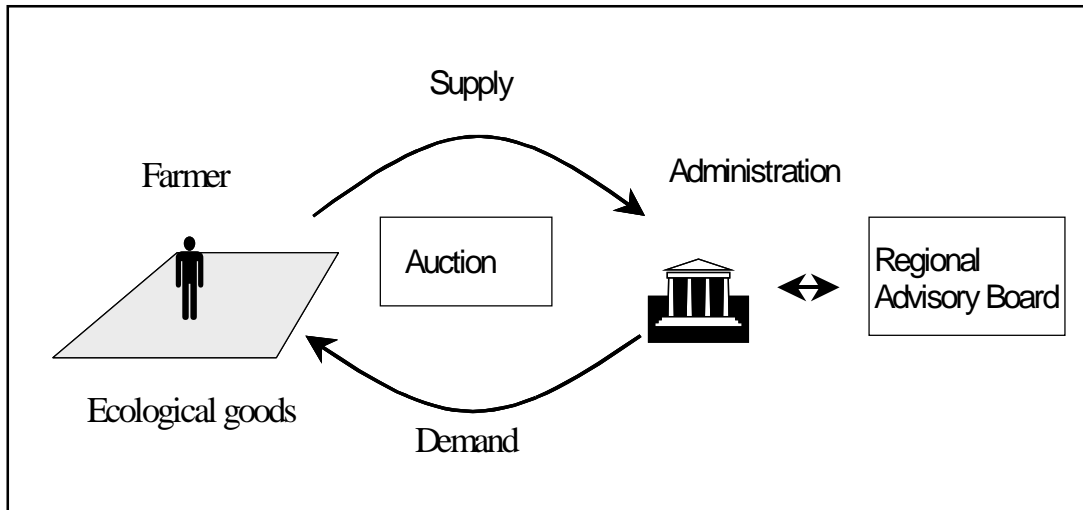
Since the early 1990s also in Germany the postulate to use auctions to reward ecological services in agriculture became bigger (e.g. Berg et al., 1993; Latacz-Lohmann, 1993; Plankl, 1998). Actually even the European Commission starts to allow the use of auctions in the context of the future agri-environmental policy. In article 37 – agri-environmental and animal welfare payments – of the “Proposal for a Council Regulation on support for rural development by the European Agricultural Fund for Rural Development (EAFRD)” it is mentioned that beneficiaries should be selected on the basis of calls for tender and criteria of economic efficiency. Also transaction costs find consideration in a way that payments may also cover transaction costs. This also shows the necessity and relevance of the research presented in this paper. Next the use of auctions to reward ecological services embodied in a regional outcome-based payment scheme will be presented.

4. The regional payment scheme

4.1. The components of the payment scheme

From 2000 to 2003 the outcome-based payment scheme was compiled. In figure 1 the payment scheme is drafted and below the substantial components of the concept are presented (Fischer et al., 2003; Gerowitt and Marggraf, 2001):

Figure 1: The payment scheme.



Outcome orientation – Ecological goods: Contrary to present agri-environmental programs this concept comprises an outcome orientated reward. The farmers will not be rewarded for particular actions but for the results of ecological services. These results are defined as ecological goods of plant diversity (Bertke et al., 2002). Ecological goods have to be clearly defined by transparent floristic criteria, so that farmers are able to prove their fulfilment and a justiciable control of the supplied ecological goods can take place as a part of the payment scheme. The aims of the production of the so called ecological goods “grassland” are the protection of regional endangered plant communities, the preservation of grassland on marginal sites and the promotion of species-rich grassland. Therefore the number of species per plot and a catalogue of grassland species that are adapted to extensive grassland management and characteristic for regional plant communities are suitable for the definition of ecological goods grassland. Related to the ecological quality – represented by the number of species – three kinds of ecological goods grassland were defined. Grassland I represents the lowest and grassland III the highest level of ecological goods. An appropriate direct linkage of the remuneration of farmers and ecological results leads to a more efficient employment of public means assume as in existing agri-

environmental programs (Hespelt and Bertke, 2003). The ecological goods grassland are achieved, when the criteria of the goods are fulfilled on the total grassland plot. To determinate and control these goods, standardised methods will be tested during the proving of this payment scheme up to September 2006.

The principle of subsidiarity – The Regional Advisory Board: In the period from 2000 to 2003 a Regional Advisory Board, witch represents the public demand for ecological goods has been assembled. According to the principle of subsidiarity, the Regional Advisory Board expresses the demand for ecological goods by deciding about the allocation of funds for the defined goods. This regional group of experts acts by majority decisions and consists of all relevant stakeholders in the model-region, like representatives from the Norheim Country Municipal Council, the Department for Construction and Environment, the regional office of the State Department of Agriculture, the regional office of the Chamber of Agriculture, NGOs, the Farmer's Union and landowner groups. Based on the Regional Advisory Board's demand, the regional administration invites tenders to make offers about the production of ecological goods and accomplishes the bidding procedure. In the context of the research project the auction is accomplished by the researchers involved in this project. To achieve a further increase of the social acceptance and a – in the best way – sustainable implementation of this payment scheme as an institutional innovation, apart from expert knowledge also regional population's preferences will be integrated into the decision of the Regional Advisory Board. Therefor a method will be developed to enable the continuous determination of the population's preferences for ecological goods in the model-region. These preferences will be presented to the Regional Advisory Board and should find consideration in the demand for ecological goods.

Auctions – Efficiency: The use of uniform premiums to pay farmers – as embodied in agri-environmental programs at present – leads to substantial problems. It achieves only a low participation ratio in some regions whereas, in other regions, windfall profits arose. This causes an inefficient use of public means (Holm-Mueller et al., 2002). This is the case, since with a uniform premium the farmer's individual cost structure and production conditions do not find consideration and all farmers receive a uniform remuneration (Plankl, 1999). Auctions therefor leading to individual payments equal to the farmer's bids could be the instrument to solve this problem. In the course of this price calculation it is to be expected that the farmers will deliver different offers based on their individual cost

structure and relevant production conditions. Therefore the possibility for a higher efficiency and a higher ecological use compared to an uniform premium is given. So the orders can be assigned market-similarly on the basis of individual calculated offers to the most efficient farmers. Moreover the use of auctions comprises financial incentives to innovations and a more efficient employment of the factors of production. So farmers try to reduce their costs of production and increase the possibility for an acceptance of bids in future auctions.

4.2. The proving in the model-region

To make sure that this regional payment scheme is not just a theoretical construct, but could be an institutional innovation as a part of the future agri-environmental policy it needs to be tested. In January 2004 the empirical proving started in a model-region – the administrative district Northeim in the south of Lower Saxony (Germany). Thereby the realisation of the first bidding procedure and the production of the tender documents was focused. This was accomplished in close contact with the responsible administration, in order to prepare an efficient implementation into the practice. The public proclamation of the auction took place on the 1st of June 2004. Afterwards in a period of six weeks the farmers in the model-region could request the tender documents and make their offers. On the 10th of July 2004 the offers were opened and evaluated by the project collaborators. Until the 17th of July 2004 the commitments and denials were sent to the farmers and those whose offers were accepted, were contracted to produce ecological goods according to they offers. Each farmer had to deliver an individual offer for every plot of grassland. The offer includes the choice of the ecological good (grassland I, II or III), the calculation of the price per hectare and the exact description of the grassland plot on witch the ecological goods exist or will be produced. This shows the specification of an auction. Farmers have to calculate in an entrepreneurial way, orientated on their specific ecological production conditions, witch leads to differentiated offers. The exclusion criteria in this first auction were economic criteria based on the price per hectare and the ecological valuation took place by the graduation of the ecological goods grassland I, II or III. The control of the offered ecological goods will take place until the 31st of July 2005 and if the ecological goods could be proved the way they were offered, farmers get paid in August 2005. Below the most relevant results of the first bidding procedure and first empirical data from two surveys in the administrative district Northeim will be presented.

5. Results of the first auction

In the beginning of the first bidding procedure in April 2004, the Regional Advisory Board decided about the demand for ecological goods and agreed that ecological goods in grassland should be announced in the first auction. These ecological goods were classified into grassland I, grassland II and grassland III, whereas grassland III represents the highest quality of botanical diversity.

The tender documents were requested by 140 farmers in the model-region. 75 at information meetings which took place in the beginning of the bidding procedure in June 2004 and 65 via telephone or e-mail. In the end 38 farmers with together 199 plots delivered offers, which corresponds to a total area of 350,71 hectares. Three offers could not find consideration since they had only been received after the offer period. Further three offers were rejected, since they exhibited formal defects. Due to a limited budget of 30.000 € an acceptance of the tender could not be given to all offers. 28 farmers with altogether 159 plots received an addition. This corresponds to an area of 288,56 hectares. Differentiated by the ecological goods grassland I, II and III the results of the first auction are shown in table 1.

Table 1: Results of the first auction.

| Ecological Goods | Offered Plots | Accepted Plots | Price Area per hectare |
|-------------------------|----------------------|-----------------------|-------------------------------|
| Grassland I | 148 (250,99 hectare) | 109 (198,25 hectare) | 40 - 250 €(Ø 98,63 €) |
| Grassland II | 35 (61,24 hectare) | 32 (53,33 hectare) | 55 - 300 €(Ø 175,29 €) |
| Grassland III | 18 (36,98 hectare) | 18 (36,98 hectare) | 100 - 350 €(Ø 202,78 €) |

We can see, that for grassland I 148 plots were offered, from which 109 got accepted. This corresponds with 198,25 hectares. The range of the advertising prices of all offers for grassland I covers 40 to 250 € per hectare. At the ecological goods grassland II from 35 offered plots 32 were accepted, what corresponds to an area of 53,33 hectares. The range of prices comprises 55 to 300 € per hectare. All 18 offered plots with a total area of 36,98 hectares were accepted at the ecological goods grassland III. The prizes for grassland III cover 100 to 350 € The available budget was divided with 54 % to grassland I, 24 % to grassland II and 22 % to grassland III.

These results show, that in this case the use of auctions in fact leads to very differentiated offers and comprises thus a practical potential for a more efficient use of public funds.

6. Two surveys of local farmers

6.1. The first survey

In the first survey all farmers who requested the tender documents had as well received a written questionnaire in a separate envelope. This questionnaire contains questions about the attendance or non-attendance at the bidding procedure, about the payment scheme and agri-environmental programs in general. Furthermore the farmers were asked to specify the time they spend to take part in the auction. This data will be evaluated in a substantial study on the transaction costs related with the farmer's taking part in this payment scheme and in comparison with taking part in existing agri-environmental programs. From 35 farmers participating in the questioning, 30 delivered an offer and 21 farmers operate the farm as a sideline. 24 farmers work in a conventional and eleven in an ecological way.

As the aspect which causes most difficulties to the participating farmers, the price-calculation proves. However in smaller measure than expected, because to 50 % of the farmers the price calculation delivered relatively heavily difficulties. The other 50 % valued the price calculation as relatively simply. Asked for the reasons why the price calculation causes problems, the uniform reason was, that there was no comparison or empirical values to be present and that it is the first auction ever in which the farmers in the model-region participated. From this it can be concluded that these farmers are not quite able to calculate orientated at their own individual cost structures and they still focus on an externally given point of reference, similar to an uniform premium.

A further goal is to determine the expenditure of time which is connected with the offer generation for the participating farmers. These data is processed in a comprehensive transaction cost study, in which the appropriate transaction costs of the farmers will play a central role. Some of these results are now introduced briefly. For the procurement of the tender documents an average value of 32 minutes was needed. The reading and understanding of the tender documents took 39 minutes in average. The calculation of the price, including the choice of the ecological goods and the plot takes in the average 90

minutes. The immediate filling of the tender documents took 77 minutes at average. So, related to this first survey, the whole submittal of offers averages about 238 minutes.

18 farmers had already participated in agri-environmental programs in the past. Compared these expenditure of time with the participation in existing agri-environmental programs, three farmers evaluate the expenditure of time needed to take part in the auction as much higher, three as higher, six as equal, five as lower and one farmer as much lower. In another question the farmers where asked to compare the expenditure of time to take part in the auction with a general aid request and 32 farmers delivered an answer. One farmer evaluates the expenditure of time during the bidding procedure as much higher, four estimates it as higher, 17 as equal, nine as lower and one farmer as much lower. Finally I would like to deal in the context of this contribution with the evaluation of the use of auctions in agri-environmental programs. Three farmers judge the use as very good, ten as good, ten as mean, seven as bad and four as very bad.

6.2. The second survey

In the second survey all 37 farmers² who made an offer during the first bidding procedure were asked, so the database for a comprehensive transaction cost study can be extended by further detailed questions particularly to the expenditure of time of the farmers, possible price agreements with others farmers and detailed questions concerning the farmer's transaction costs. The goal is – apart of the determination of transaction costs – to draw conclusions on the practical efficiency of auctions in agri-environmental programs generally and particularly as a part of this remuneration concept.

In the context of this paper the results concerning the farmer's transaction costs are focused and presented. One main aspect was to value the farmer's expenditure of time needed to participate in the first auction. Therefor the farmers were asked to tell, what they think is an adequate remuneration if they would be paid immediate for making an offer and 21 farmers answered that question. The value differs from 10 to 25 €per hour and leads to an average earning of 16,76 € per hour or 0,28 € per minute. Multiplied with the average expenditure of time – 238 minutes as ascertained during the first survey – the average

² In fact 38 farmers made an offer, but in the context of the second survey one farmer could not be considered.

farmer's transaction costs of making an offer are about 66,48 € and could be presented as a first brief result and benchmark at that time.

Concerning a reduction of transaction costs, in the second auction the use of the internet and digital forms will be tested. Asked if farmers would use this way of making an offer, at least ten of 24 answered with yes, which offers another potential to reduce farmer's and administration's transaction-costs, compared to the first auction.

Behind the context of the regional foundation of this payment scheme it is interesting how the farmers think of the fact, that the Regional Advisory Board decides about the demand for ecological goods. 24 farmers gave an answer and two farmers think it's very well that the Regional Advisory Board is the only decision-maker in this context. Three farmers value this as good, twelve as mean, two as bad and five as very bad. This can be interpreted in a way, that at that time the farmers do not (yet) think of the Regional Advisory Board as a necessary new institution as a part of the administration. It's obvious, that further research is needed to analyse the acceptance of this committee as the special regional component of the payment scheme, especially with the focus on its sustainable implementation into a future agri-environmental policy.

Also these results of the first two surveys speak for a possible successful and efficient implementation of most components of this new payment scheme to reward ecological services in future agri-environmental programs. So finally the following conclusions can be drawn at that time.

7. Conclusions

The first practical experiences and results during the first auction and the first two surveys show, that this outcome-based payment scheme to reward ecological services in agriculture is not just a theoretical construct, but that it also works very well in practise.

The results of the first auction show that in fact very differentiated offers were made by the farmers in the model-region. This comprises a practical potential for a more efficient use of public funds by the use of auctions as with a uniform premium, like it is used in current agri-environmental programs. But still more research is needed to analyse the dynamic and

development of the prices in the next auction. Thereby it will be interesting to see how the price levels will develop and if the price areas will spread or if they even adjust to an in fact uniform premium. This will be analysed during the second auction, starting in May 2005.

Also these first results show, that the expenditure of time needed for farmers to take part in the auction are likely not significant higher than in existing agri-environmental programs. Furthermore it was the first auction farmers participated and a reduction of corresponding transaction costs – caused by e.g. filling out forms, calculating prices or taking part at the auction in general – can be expected during next auctions. Seen from a transaction cost economics point of view the results of the first survey of farmers show, that auction have a high potential to be used as an award procedure and that farmers are able to deal with auctions.

To evaluate the components of the regional payment scheme after the first auction differentiated impressions emerge. As shown in this paper, the practical use of auction and an outcome-orientation – especially combined with auctions – proved to work very well in the way it was theoretically intended and received a high acceptance as well as on the part of the farmers in the model-region and the integrated regional and supra-regional administration. Whereas the component Regional Advisory Board could hardly be evaluated in an alike positive way. The main reason is, that even if the first auction took place a real sense-making process about the demand for ecological goods wasn't necessary, because of the low available budget of 30.000 € Determined by this budget and the intention to reach as much plots and farmers as possible in was at hand to advertise the ecological goods grassland, because they are relative easy and cheap to produce. So still the question is unanswered, how an additional institution like the Regional Advisory Board could be justified. Especially in consideration of the additional transaction costs connected with the implementation and run of an institution like this.

A detailed economic evaluation of the practical interaction of the individual components of this decentralised and market-similar remuneration concept will take place in the process of the conversion phase. Here it also applies to analyse the practical relevance of the New Institutional Economics. Therefor the Transaction Cost Economic and the quantification of the project-relevant farmer's transaction costs are focused. Only by this comprehensive

testing it is possible that at the end of the current conversion phase a concept adapted to practical conditions for the receipt of the biological diversity can be presented, which is legitimised both from an ecologists and an economics point of view. This will be finished until September 2006.

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