1. Institutional Arrangements for Environmental Co-operatives: a Conceptual Framework

Konrad Hagedorn, Katja Arzt and Ursula Peters

1. INTRODUCTION

The chapters in this volume address a variety of topics which refer to co-operative strategies to cope with agri-environmental problems. Some of them deal directly with environmental co-operatives of farmers (Slangen and Polman, Chapter 4; Polman and Slangen, Chapter 5; van Dijk and Sol, Chapter 6; Falconer, Chapter 13), or with important features and pre-requisites of such co-operatives like participation, co-management with bureaucracies and common property and management of common property (Claude, Chapter 2; Birner, Jell and Wittmer, Chapter 3) or with co-operative agreements and arrangements aiming at particular tasks and objectives (Brouwer, Heinz and Zabel, Chapter 14; Adamowicz and Gralak, Chapter 15). Other chapters provide important conceptual and theoretical contributions to these topics (Lippert, Chapter 10; Müller and Weikard, Chapter 11; Nuppenau, Chapter 12), show how co-operatives, co-operation and participation help to change farming practices (Gafsi and Brossier, Chapter 7; Noe and Halberg, Chapter 8; Mazé, Galan and Papy, Chapter 9) to support nature conservation (Knierim, Chapter 16; Getzner, Chapter 17), and to improve marketing (Fahlbeck and Nilsson, Chapter 18; van Huylenbroeck and Verhaegen, Chapter 19).

This chapter differs from these approaches: it provides less answers as to how agri-environmental co-operatives and co-operation should actually be developed in order to solve agri-environmental problems. Instead, it tries to ask the theoretical and methodological questions we have to deal with to achieve this goal. In this way, we try to find tools and procedures to conceptualise and to implement environmental co-operatives and co-operation

in agriculture and rural areas. Although the concept presented is incomplete and far from providing reliable guidelines for research steps towards environmental co-operation in general, and environmental co-operatives in particular, it may be instrumental in finding a systematic approach for organising into research institutions in this area.

The chapter is organised as follows: first, the main determinants of agri-environmental co-ordination mechanisms will be structured in four categories. Then, these groups of relevant factors will be described in more detail in the following sections by discussing properties of transactions in agriculture linked to ecological effects, features of the actors involved in these transactions, property rights to nature components and ecological attributes, and governance structures on a regional and local level. The last section will try to identify combinations of transactions and actors, and choices of property rights and governance structures that call for co-operative arrangements.

2 TOWARDS AN INSTITUTIONAL APPROACH TO AGRI-ENVIRONMENTAL CO-ORDINATION

Institutional change in the area of agri-environmental co-ordination, that is mainly property rights regimes and governance structures, can be understood as a response to technological (or biological) and economic factors, on the one hand, and societal and political influences, on the other. To structure and to analyse the relationships and the interplay between these factors, an explorative concept is necessary (see also Hagedorn 2000). For this purpose, it seems to be useful to distinguish between the following four groups of determinants.

1. Which institutional arrangements arise, that depend on the features and implications of the transactions related to nature and the ecosystem (for example leaching of nitrates into the groundwater on sandy soils). This is mainly influenced by the physical properties and material transformations with which environmental positives and negatives, benefits and damages are associated. Technological innovation and structural change lead to permanent changes of these properties and transformations.
2. Simultaneously, institutional change depends on the characteristics and objectives of the actors involved in those transactions (for example farmers who reinforce nitrate leaching by high nitrogen fertilisation and unfavourable crop rotation without catch crops). This is not only true for individual actors whose values, interests and resources to exert influence (power) are very different, but also for groups of individuals like communities using organisations and networks to shape institutions according to their objectives.
3. The changes in institutional arrangements, which result from the two main categories of driving forces mentioned above, affect the design and distribution of property rights on nature components, or, more precisely, on those cost and benefit streams which can be attributed to natural capital and ecosystem services (for example trade-offs between reducing nitrogen balances by means of lower fertilisation and intercropping and decline in gross margins). The property rights tend to become more and more differentiated, for example they apply not only to physical goods like land, but also to various dimensions and many details of land use relevant to environmental protection and sustainable agriculture, for example the right to decide on catch crops as an element of crop rotation.
4. Necessarily, such changes in property rights to nature components are accompanied by corresponding changes in governance structures, mainly for two reasons: first, property rights to nature components, like other property rights, must be supervised and sanctioned to become effective instead of being only formal in nature; and secondly, the actors can only make use of their rights and entitlements and will only fulfil their duties and obligations if transactions are organised and co-ordinated (for example farmers will only comply with fertilising restrictions and cropping prescriptions if an adequately working system of measuring and monitoring activities, information and administration, positive and/or negative incentives, that is of subsidies and/or penalties, exists). Similar to the property rights regimes mentioned above, governance structures are also very differentiated. They include self-organised co-ordination (for example environmental co-operatives) and governmental regulations (for example environmental bureaucracies), and they are not only related to the implementation of environmental instruments, but also to decision making on environmental policies which takes place on the different levels of co-operative federalism (community, region, province, national, EU, international). Last but not least, the political economy behind the process of joint implementation and decision making in a federal system has to be taken into account.

Figure 1.1 provides a visual representation of these four groups. We now try to describe and explain these four groups of determinants in more detail, referring to approaches of New Institutional Economics and Institutional Analysis of Natural Resources (for example, Richter and Furobom 1996; North 1992; Williamson 1996; Ostrom 1990, 1998, 1999; Bromley 1991, 1996, 1997; Loehmann and Kilgour 1998). Studies available on environmental co-operation and participation are used as an additional source

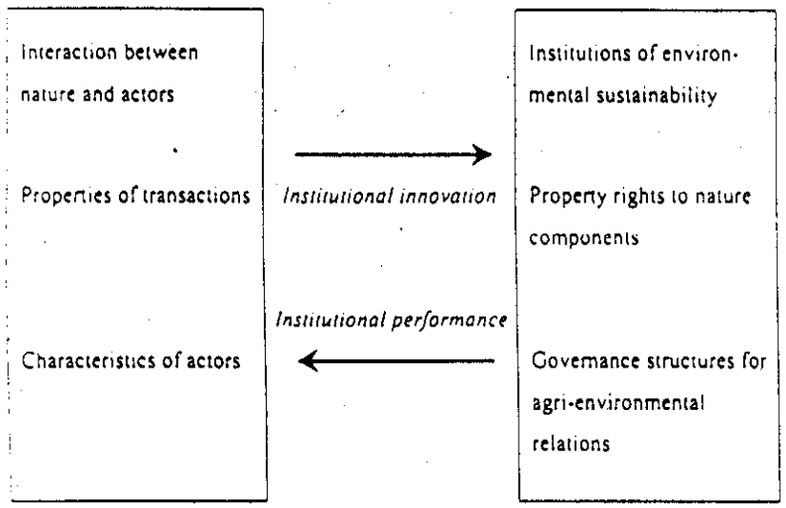

Figure 1.1 The logic of institutional arrangements for agri-environmental co-ordination

of theoretical concepts and empirical information (see OECD 1998; Bahner 1996; Zimmer 1991, 1994a,b; Campbell 1998; Fisk, Hesterman and Thorborn 1998; van Woerkum and Aarts 1998; Woodhill and Röling 1998; and the contributions to the 64th EAAE Seminar published in this volume). After having dealt with these four groups of determinants, some ideas on the scope for co-operative arrangements will be developed at the end of the chapter.

3 PROPERTIES OF TRANSACTIONS AFFECTING THE NATURAL ENVIRONMENT AND ECOLOGICAL SYSTEMS

Transactions which are relevant to the impact of agriculture on nature and ecosystems can be considered from two (opposite) points of view:

(a) Producing or increasing an environmental problem by production or consumption activities (for example, excessive nitrogen leaching) is a transaction between the farmer and the public or community concerned.

(b) Solving or diminishing an environmental problem by self-organised or government policies (for example, introducing limits to nitrogen surpluses) is a transaction between the regulator and the farmer.

Not surprisingly, these views are more or less reciprocal. We will primarily concentrate on the first one. Simultaneously, transactions at the regional level will be investigated, excluding transactions originating from higher policy levels of the federal system in the EU.

Environmental problems caused by agricultural activities can usually be considered as being a result of (often impure) public goods (or club goods and common-pool resources) whose legal transformation, defined as their transfer between different actors or groups of actors, shows particular difficulties. Some of these problematic features of transactions are specific to public goods, others can also be found with private goods but lead to similar problems when they are combined with the characteristics of public goods. The main properties are:

1. Excludability of actors from access to environmental goods, closely related to the mechanisms and costs of exclusion that have to be covered. Both mechanisms and costs of exclusion differ considerably among different natural resources and environmental goods. If exclusion of actors who are not entitled to use the goods or resources (or are only eligible to use a limited amount of it or to use it in a certain well-defined way) do not work properly, free riding will result in depletion of natural resources or undesirable environmental damage.
2. Rivalry among the users of environmental goods is also not equally distributed, if we compare the resources and goods that are of interest when dealing with agri-environmental co-ordination. Using pure public goods, like viewing a beautiful landscape, does not cause any competition among the users, because the benefits from the landscape are not reduced when the number of users increases. However, if an impure public good, like the limited amount of fish in a lake, is used by one additional actor, the amount available to all other actors will be reduced correspondingly. Between this case of complete 'subtractability', as it is called in the literature on common-pool resources (Ostrom 1998), and the other extreme situation of pure public goods, we find a continuum with different degrees of rivalry.
3. Asset specificity and the resulting co-ordination problems to be solved by adequate institutional arrangements can be observed if durable investments have been made by the supplier in order to prepare for a long-term relationship between the parties involved. As pointed out in the fixed-asset theory (Johnson and Pasour 1981), such assets will lose much of their value if the contract is voided earlier than expected. This enables the purchaser to lower the price of the goods or services provided by means of durable investments and calls for adequate governance structures to avoid this sort of strategic behaviour (lock-in and hold-up

situations). In the case of agri-environmental goods, asset specificity plays a major role in at least three cases (see also Slangen and Polman, Chapter 4, this volume): (a) site specificity, for example if a specific biotope or species that a farmer takes care of by means of adequate agricultural practices, is located in a certain area or plot, (b) capital specificity, for example if a farmer has invested sunk costs in nature conservation (planting hedges, and so on), and (c) specific knowledge which land users and inhabitants have collected and developed on nature and the environment where they live and work, representing group-specific human capital.

4. Separability is often low due to joint production of the environmental goods provided by the farmers. This is a widespread and important feature, for example with regard to landscape and habitats, a fact that is particularly emphasised by Falconer (Chapter 13, this volume). This requires a governance structure which is able to co-ordinate the activities of the group of landowners participating in the production of the common good. If this involves incentives provided by political agencies, for example agri-environmental policy payments, it is often inadequate to orient these monetary supports only to individuals.
5. Frequency of transactions may differ considerably, for example if we compare single resource utilisation like deforestation with seasonal utilisation patterns, like wheat cropping. Recurrent transactions make it easier to invest in specialised governance structures, because the costs can be distributed over many transactions, economies of scale can be made use of and learning by doing over time helps to find more efficient solutions. Most of the transactions which are relevant to the impact of agriculture on the ecological system and the natural environment show high frequency, for example fertilising with nitrogen. However, if long-term agreements are made, this implies a much lower frequency of decision making.
6. Uncertainty plays a major role in the demand and supply of agri-environmental goods and services, because farmers and regulators do not know very precisely either whether certain environmental problems will arise, and when they will occur, or what the nature of these problems will be, and to what extent they will have serious impacts and who will be affected. The same is true for the policies and activities aimed at preventing these problems. Reduction of these uncertainties causes transaction costs, for example for measuring and monitoring environmental degradation and gathering adequate information. This property of agri-environmental transactions is closely connected with the following feature, and its relevance is considerably reinforced by the facts mentioned in the next paragraph.

7. Complexity of the causal relationship of ecological systems, particularly as it is combined with the still insufficient availability of well-established scientific knowledge, invites actors to practice opportunistic behaviour. For operationalising transactions, the complex ecological phenomena have to be described by means of simplifying criteria. If even scientists do not know what is the right thing to do for the environment, individual demanders will find it difficult to form reliable and reasonable preferences. In addition, as public goods are at stake, these preferences have to be channelled and aggregated by complicated organisational procedures. In this process, simplification is indispensable, particularly if government bureaucracies are involved. This is even more necessary if they have to collaborate across several policy levels in a federal system like the EU. While for private goods, like bread or sausages, consumers are quite well able to reveal their true preferences, preferences for environmental protection in the agricultural sector are likely to be distorted when they finally arrive at the supplier, for example at the land user. The latter and his political representatives, for example farmers' unions, may consider this as an opportunity to influence the process in a way that makes it easier for farmers to comply with the environmental requirements, for example by choosing a favourable indicator and monitoring system and producing plausible justifications for compensation payments. The tendency of CAP to instrumentalise environmental aspects for legitimating income policies is obviously a strategy of this kind.
8. Heterogeneity and variability are typical attributes of 'many environmental problems, especially those to which agriculture contributes, (which) are heavily influenced by stochastic phenomena, such as the weather' (OECD 1998, p. 17). The same applies to other differences between vegetation periods or plots of land, for example regarding soil quality. It is difficult to design strategies and measures that are adjusted to the manifold phenomena of heterogeneity and variability which could also be termed 'site and situation specificity'.
9. Legitimacy refers to the question of whether or not transactions are compatible with the normative views of the actors and groups concerned by or even involved in both decision making and implementation activities. Penalising farmers who pollute the groundwater may appear to be much more legitimate than distributing pollution rights to them, even if the latter strategy may yield better ecological as well as economic effects.

4 CHARACTERISTICS OF ACTORS INVOLVED IN AGRI-ENVIRONMENTAL CO-ORDINATION

Before turning to the differences and particularities of the actors involved, it should be mentioned that the distinction between properties of the transactions and characteristics of the actors sometimes appears to be rather artificial. This is because the actors certainly shape and arrange the transactions related to physical and natural elements of the environment, but they, in turn, are simultaneously influenced, or even formed, by what they are doing. For example, by cultivating his land using modern farming technologies, a farmer gains practical knowledge and detailed local information about the response of nature to the applied technologies, and it is difficult to decide whether this feature should be attributed to the transaction or to the actor.

Furthermore, we have to be aware of the fact that we could think of numerous categories of actors which might also include policy makers and administrators at the national and EU levels. However, we restrict our considerations to land users and regulators or co-ordinators on the regional level, for example administrators of a government agency or managers of a self-organised environmental co-operative. Of course, the ability to mobilise their political entrepreneurs and, in this way, to exert political pressure can be an important attribute of these actors, like the following attributes:

1. The values and beliefs of the actors and their particular attitudes and perceptions of agri-environmental issues are relevant to their readiness to collaborate with other actors and to comply with rules of co-operation and also with policy measures. Admittedly, if farmers are purely self-interested, they can still be motivated towards environmental goals by economic incentives. But if they are convinced that sustainable agriculture is an objective worth working for, they will be prepared to be systematically involved in such activities. Their values have an influence on how they evaluate situations which require (often collective) decisions in favour of sustainability.
2. It is equally important, particularly for contractual and co-operative arrangements, how actors are evaluated by other actors. This refers to their reputations for reliability and trustworthiness which are decisive factors for the credibility of their commitments. Polman and Slangen (Chapter 5, this volume) have particularly emphasised the importance of credible commitments for the emergence and stability of co-operative arrangements.
3. Resources for influencing agri-environmental strategies like self-organised co-ordination of agri-environmental activities or administrative implementation of agri-environmental policies at the regional and local levels, that is by direct participation in these processes. This refers to resources, like time and capacities to collect information, access to networks and bargaining power, which are necessary or instrumental to establish and maintain relationships and to achieve acceptance of own interests. Actors who are involved in processes of communication usually have advantages and groups whose members can communicate with each other can more easily find common rules (Ostrom 1999).
4. Resources for influencing processes of political decision making and policy implementation at higher than the regional level, that is mechanisms of interest representation in decision-making processes in which land users cannot participate directly. Farmers can use well-established channels for delegating the enforcement of their political demands to political entrepreneurs. The Political Economy of Agricultural Policies is based on intensive political preferences of farmers; electoral control and party competition; interpretation systems for justifying farmer-supporting policies; farmers' unions as efficient organisations for collective action; friendly relations with bureaucracies, ministries and parliamentary committees, an agrarian policy network, joint decision making of agricultural experts across all levels of the federal system; and so on (see, for a more detailed theory, Hagedorn 1996a,b; 1998).
5. Information and knowledge, and capacities for acquiring and processing, retaining and using knowledge and information represent a resource that has to be mentioned separately. Above all, asymmetric information of actors, well known from the principal–agent theory, is a widespread phenomenon in agri-environmental decision making. Farmers who know a lot about their land and the vegetation on it and are at the same time well aware of the fact that administrators find it difficult to obtain such detailed information, may not be able to resist the temptation of opportunism. For example, they may accept extensification subsidies for plots they could not use intensively anyhow.
6. The 'actor's method of action selection' (Ostrom 1998, p. 70) may also be very different between the persons involved. These persons can be assumed to be maximising homines oeconomici, as constrained maximisers with bounded rationality, or fallible learners who make mistakes but are able to learn from them. For explorative and innovative tasks like forming institutions dealing with new problems which arise from changes in agricultural technology and structures, the latter two assumptions seem to be appropriate.
7. In addition, the social environment and embeddedness of actors affect their behaviour. 'Community attributes relevant to the structure of an

action arena include behavioural norms, the level and nature of the common understanding shared by potential participants, the extent to which those living in the community have homogeneous preferences, and the distribution of resources. The term culture is frequently applied to this bundle of variables. When all appropriators of a common-pool resource share a common set of values and interact within a complex set of arrangements, there is a much greater probability that they will develop adequate rules and norms to manage resources. ... If keeping one's word is important in such a community, the need for costly monitoring and sanctioning mechanisms is reduced. Conversely, if the appropriators of a resource represent different communities, or are distrustful, then the task of devising and sustaining effective rules is substantially more difficult' (Ostrom 1998, p. 71).

What mechanisms will arise or could be chosen to co-ordinate the transactions between the actors are both described in the preceding sections. It has already been pointed out that these co-ordination mechanisms can be conceived of as an interplay between property rights regimes and governance structures. Therefore, the next two sections structure these two areas of institutional arrangements.

5 PROPERTY RIGHTS TO NATURE COMPONENTS RELATED TO AGRICULTURE

Property rights theory is often misunderstood as an approach explaining the definition and distribution of disposition rights focusing on physical entities (that is, material goods). This view needs to be modified as regards the following aspects:

1. Strictly speaking, actors only attribute (positive or negative) values to a physical good because the right holder is favoured by benefit streams or in case of a duty is burdened by cost components which are connected with the physical good. Bromley (1991, p. 189) calls these nature components 'countryside and community attributes' (CCA), de Groot (1992, p. 13) environmental functions (regulating, carrier, production and information function). These ecological properties that are linked to costs and benefits which can be derived from a physically defined piece of nature can be further differentiated according to results (that is, impacts of pieces of nature on costs and benefits) or according to actions (that is, ecologically relevant activities when dealing with nature).

2. A natural good, like soil, is usually considered to carry only one homogeneous property title. However, such rights cannot only be classified according to the conventional division into (a) the right to use, (b) the right to alter and (c) the right of alienation. What is more, categories of property rights can be separately defined for numerous ecological properties of the physical piece of nature, each of them related to particular costs and benefits. For each of these differentiated rights components, the institutional design of the right or duty can differ: private, collective and state property regimes are imaginable, and also the absence of property rights definition and delineation in the sense of open access (Bromley 1991, 1997; Ostrom 1990).
3. However, creating and using property rights will not take place without transaction costs, which are, for example, caused by defining and establishing these rights and also by measuring the environmental attributes they apply to and supervising that these attributes are properly provided. Since these transaction costs can be prohibitively high and may exceed the benefits, property rights for some or even many components of nature may not be established. This may change when the valuation of an environmental attribute increases or when the distribution of the benefits changes or when the transaction costs of enforcement of the single rights or of measuring and supervising the nature components decrease, for example, as a consequence of technological progress (Barzel 1989).
4. The resulting structure of property rights is usually supposed to be reasonable if the rights related to the differentiated attributes accrue to those actors who can influence their design in the most efficient way. Since it seems legitimate in this case, too, that he or she may obtain the surplus value, that actor also becomes a 'residual claimant' (see also Lippert, Chapter 10, this volume). In this context, low transaction costs are an argument for bundling the rights on all nature components of a physical object in the hand of one actor, whereas the advantages of specialisation and economies of scale may favour distribution of the single rights to different actors ('divided property'). This raises the question whether particular (partial) rights, for example the right to organise ecological networks of biotopes and habitats, which is a control right, should be given to special actors, for example to environmental co-operatives or regional agencies (Hodge 1991; Lippert, Chapter10, this volume).
5. Bundling property rights on the manifold components and attributes of a physical piece of nature, that is giving it to one land user, usually means at the same time that the distribution of rights is rather decentralised (at least, if there are many land users like farmers). Dividing those rights

between the land users and other specialised agents automatically results in a higher degree of centralisation of those rights that the former holders are deprived of. This has, of course, social and political consequences. It may affect the motivation and participation of the land users, precipitate moral dilemmas and lead to less identification with the local and regional natural environment

6 The term 'property rights to nature components or ecological attributes' certainly is useful on the one hand, because it reflects the fact that there are manifold claims on agricultural production and that land and other natural assets used by agriculture are related to a variety of cost and benefit streams, many of them being public positives or negatives. On the other hand, it could support the notion that each of those fragmented rights could be used, and each of the single duties could be fulfilled, in an isolated way. As we are dealing with ecological systems, this will neither be possible nor reasonable. Perhaps it might be more appropriate to talk about rights and duties which are conditional upon the use and fulfilment of other rights and duties respectively.

6 GOVERNANCE STRUCTURES FOR REGIONAL OR LOCAL AGRI-ENVIRONMENTAL CO-ORDINATION

In New Institutional Economics, usually three categories of governance structures (see Williamson 1996) are distinguished: markets, hierarchies – or, more generally, considered as 'organisations' – and so-called 'hybrid forms', sometimes termed as contractual relations. Slangen and Polman (Chapter 4, this volume) try to put more emphasis on this 'third way of co-ordination' and call it 'horizontal non-market co-ordination' where also co-operation can find its place. The scope for reasonable applications is extended to a type of governance structure which plays an important role in reality.

Another extension of the concept can be derived from the following reasoning: First the categories of governance structures mentioned above predominantly reflect the relationship between actors involved in a transaction. Secondly, action selection is obviously considered the relevant subject of this relationship. In markets, selection of action is based on voluntary bilateral agreements between individuals, in hierarchies action is compulsorily selected by an authority on a higher level, and contractual relations contain both voluntary action before the contract has been finalised and compulsory action when the contract is in force. However, transactions which are relevant for agri-environmental phenomena are not limited to the question of whether action selection is voluntary or compulsory, and they are even not restricted to selecting action, but include many other activities which represent either prerequisites or consequences of action selection. This refers to gathering and processing knowledge and information, measuring and monitoring, bargaining and conflict resolution, organising adjustments and regulating liabilities, and so on.

How can we conceive of this extended range and more comprehensive meaning of governance structures? The Enquête Commission of the German Bundestag 'Protection of Man and the Environment' has recently published two books on the institutional interpretation of sustainability. In its works previously published, the Commission had mainly concentrated on the question: what is sustainable development? Objectives of environmental quality and activities were defined, for example for the area of soil protection, and management rules as well as policy instruments for the implementation of sustainable development were developed. However, sustainable development has to be conceived of as a comprehensive process of searching, learning and gaining experience. For that reason, it is not only the question of what might be sustainable development but also the question of how and by means of what organisational principles applied to learning processes in society sustainable development can be achieved. As a consequence, environmental goals and their implementation by means of policy instruments is not the only task. In addition, sustainable development has to be interpreted as a regulative idea which requires adequate institutions to become effective in the various areas of society.

For this purpose, the Commission has defined four basic strategies (Minsch et.al. 1998):

- Strategies to improve reflexivity: These strategies reinforce the sensitivity of all actors regarding the ecological, economic and social side effects of their behaviour. Such strategies can be seen as an answer to the increasing complexity and differentiation of societal and political processes. Strategies of reflexivity have to be implemented at all levels and in all phases of the political process. In many cases they serve as a starting point and as a basis for further institutional reforms of the processes of consensus building and policy making
- Strategies to reinforce self-organisation and participation: These strategies can be considered as a response to the fact that political processes are increasingly isolated and separated from the citizens and the people concerned. Accordingly, self-organisation and participation are supposed to have an integrative impact by which politics are embedded again into society. People and groups concerned with political decisions are supposed to become political actors again, and poorly organised groups which are not able to express their interests in the political sphere, for example many social and ecological interests may use such strategies to get a hearing in the political process

- Strategies for interest harmonisation and conflict regulation: These strategies aim at balancing inequalities of power and control over resources. They may lead to constructive solutions regarding conflicts between different interests and conflicting values, for example between ecological, economic and social aspects of sustainability. Particularly in the agricultural sectors, ecologically motivated restrictions on property rights and new environmental policies cause winners and losers. The feasibility of such concepts may be lacking if mechanisms to deal with conflicts of distribution are underdeveloped.
- Strategies for innovation: These strategies create new options and capacities for action in society which may be societal, political, economic or technical in nature. They provide possibilities for creative processes of searching and learning in society during the process of achieving sustainable development. In this way, they may help to reduce or even to avoid conflicts between the different objectives which constitute sustainability. Co-operative approaches to cope with environmental problems on the regional level could be an example for such innovations.

The Commission stresses the point that the actors in a society should learn to interpret their position as a member of a network. They are supposed to take into account the framework conditions of other actors and the determinants and constraints guiding the development of society as a whole, and they are expected to include these aspects in their own decision making. A better understanding of mutual dependencies enables each actor to integrate long-term societal conditions into his or her reasoning and helps him or her to contribute to sustainable development.

In this way, society is moving towards a 'learning organisation'. Sustainability as a regulative idea requires such processes of searching within society because the design of institutions and of policy instruments cannot immediately be derived from this basic principle. As a consequence, discourses play a central role in this process of learning. Organising such discourses requires learning organisations which both provide signals for learning processes to and receive such signals from society. Learning organisations as well as the learning society as a whole can be conceived of as being both prerequisites and results of the processes of discourse.

In principle, all the aspects of governance structures supporting sustainability also apply to agri-environmental co-ordination on the regional and local level. Accordingly, the following elements play a role:

1. markets, for example tradable pollution quotas;
2. hierarchies (organisations) like environmental bureaucracies;
3. hybrid forms (contractual relations), for example stewardship contracts;
4. horizontal non-market co-ordination, that is co-operation and participation of farmers;
5. knowledge and information systems, formal and informal networks;
6. methods and infrastructure for measuring, monitoring and evaluating environmental damages and benefits, for example laboratories;
7. rules and procedures for conflict resolution, distribution of costs and benefits, regulation of liability;
8. incentives and opportunities to promote innovation and learning.

In reality, governance structures will consist of different combinations and complex arrangements of these elements.

7 THE SCOPE FOR AGRI-ENVIRONMENTAL CO-OPERATIVES AND CO-OPERATION AS AN INSTITUTIONAL INNOVATION

Of course, nobody will reasonably expect that co-operatives and co-operation can solve all agri-environmental co-ordination problems. In other words, this would mean that

(a) for all combinations and groupings of transactions and actors with the described properties and features, co-operative arrangements would be the most efficient institutional innovation, which would prove to be superior in a process of institutional competition with other institutional solutions;

(b) all institutional solutions designed in an optimal way to deal with the co-ordination problems originating from those combinations and groupings of transactions and actors with different properties and features and, hence, surviving institutional competition, would fall into the range of co-operative arrangements, leaving the other categories outlined above empty.

As a consequence, the question arises as to when co-operatives and co-operation will be competitive and when other institutional alternatives will be preferred. If we could find answers to this question, we simultaneously would have better knowledge of how we should orient our efforts to intentionally design institutional innovations in this area. However, since most of the answers are still lacking, we must restrict ourselves to a few arguments for identifying situations and solutions in which priority might be given to co-operative arrangements. According to the structure of groups of determinants

developed in this chapter, we start by asking which transactions could be co-ordinated by co-operatives or co-operation:

1. Costs of administration, monitoring and enforcement, or generally speaking, the transaction costs of policy, can be lowered by co-operation and participation (see Hanna 1995). 'During the stages of problem identification and policy design, transaction costs are minimised by a top-down approach – that is one that avoids spending time and resources in co-ordination, information, dissemination and conflict resolution. However, such an approach creates uncertainty in the mind of the users as to the goals of the process, encouraging short-term actions at the expense of long-term sustainability. By contrast, the bottom-up approach, involving extensive participation by users, gives them a stake in the outcome and reduces uncertainty about the process goals. Users are more likely to comply with regulations, and to adopt a stewardship ethic, when they understand and endorse the policy goals, and have some assurance of control over outcomes' (OECD 1998, p. 16). In other words, when visibility and transparency are low and costs of monitoring and supervision are high, compliance with environmental rules and norms can be improved by participation and co-operation instead of using hierarchical instruments of enforcement. In addition, group leaders or co-operative managers can make use of tools for control and enforcement government agencies cannot access, like appealing to members' loyalties and applying peer pressure.
2. Economic approaches often try to attribute well-defined values and tasks of functions to components of nature and corresponding criteria to environmental problems that would enable them to find optimal and stable economic solutions. However, some authors criticise this view because it considers natural resources in the same way as 'commodities', as if goods derived from nature and ecosystems were separate and discrete elements (Berkes and Folke 1998; Holling, Berkes and Folke 1998). Additionally, natural systems are always dynamic and many of their changes are not predictable (see Hanna, Folke and Mäler 1996). As a consequence, institutions are necessary which account for the complexity and dynamics of such systems. Environmental co-operatives may be appropriate solutions for this, because they use local knowledge and adjust to local conditions.
3. Balance of power between farmers and government agencies may be a problem because of the opportunities to practice opportunism against farmers due to the above-mentioned reasons of site and capital specificity. Agri-environmental co-operatives can build countervailing power, and co-operative contracts between such co-operatives and administrative units may avoid hold-up problems. In addition, the managers of the co-operatives can contribute to farmers' interest representation and develop procedures of conflict resolution regarding relations to external agents.
4. While some agri-environmental problems like soil compaction can be tackled by addressing single farms, many other environmental issues related to agriculture require participation of several or even many farms, for example reduction of habitat fragmentation and maintenance of ecological networks (see also Falconer, Chapter 13, this volume). Specifying and exploiting property rights which have remained in the public domain because they could not be separated and allocated to single land users due to high transaction costs (see, for this aspect, Slangen and Polman, Chapter 4, this volume) also belong to this point. The spatial distribution of ecological effects originating from the production activities of individual farmers is relevant for potential gains from joint action for capturing such externalities (see, for more details, OECD 1998, p. 20).
5. Due to the fact that transactions in agriculture which are ecologically relevant often show a high degree of heterogeneity, as mentioned above, 'uniform standards and charges that are non-targeted . . . are relatively inefficient instruments for dealing with such variability. On the other hand, any public law approach that involves frequent tinkering with constraints and penalties, besides requiring a considerable effort in order to communicate changes to those expected to comply with law, in general risks reducing their acceptance of it. . . . More generally, delegating greater responsibility of environmental and resource policy to social institutions may prove to be the only pragmatic way for governments to deal with the number and complexity of environmental issues that they are being asked to address' (OECD 1998, p. 17).

Similarly, the following features of actors play a role for the establishment of agri-environmental co-operatives:

1. The importance of trust and credible commitments has frequently been emphasised in the literature on co-operative management of natural resources (see, above all, Ostrom 1999). It has also been treated in some detail by Polman and Slangen (Chapter 5, this volume). One of the main insights of the literature available on this issue is that trust and credible commitment are not just an individual accomplishment of the persons involved, but can be systematically provided in a stable, long-lasting way by means of organisation and culture (Ostrom 1999, p. 46, p. 56). Here we can find another opportunity for environmental co-operatives which

may be better able to fulfil these conditions than other institutional options.

2. Conflicts about environmental problems and natural resources increase in the countryside leading to polarisation of stakeholders and contradicting interests. The 'fundamental strength of co-operative approaches to resolving natural resource disputes is that they encourage the various stakeholders to identify with the particular place, environment, resource and to take responsibility for it' (OECD 1998, p. 18). The co-operative-conflict model used as a conceptual basis for a co-management approach by Birner, Jell and Wittmer (Chapter 3, this volume) aims at similar goals.
3. Mutual learning among practitioners is another advantage of co-operation, particularly if the farmers and other land users have frequent contact in an atmosphere of trust. They may exchange experiences and ideas which stimulate them to find solutions to their problems and to introduce technological and organisational innovations.
4. Whether or not an environmental co-operative is stable and successful depends not only on the members and the management of the co-operative itself. It is important that other actors and organisations recognise the co-operative as a legitimate partner. Ostrom (1999, p. 131) mentions that those fishing co-operatives that were recognised by the regional governments and to which the tasks of co-ordination were delegated, proved to be more stable than other ones.

8 CONCLUDING REMARKS

As far as the selection of a reasonable property rights regime for environmental co-operatives for farmers is concerned, an important question is whether or not farmers should keep their rights to nature components and ecological attributes or whether these rights should rather be transferred to the co-operative. As has been pointed out above, one of the main arguments for environmental co-operation is the opportunity to use local and detailed knowledge of the land users and to reduce the transaction costs of implementation by increased participation. Taking away property rights, and the corresponding duties, to nature components from the members of environmental co-operatives counteracts these objectives. In contrast, responsibilities and motivation for sustainable agriculture should remain with the land users, for example farmers, and the co-operative should rather be understood as a governance structure co-ordinating the members' activities by working rules and management procedures.

For the same reason, that is asymmetric information and motivation of producers, property rights are divided in other areas of the economy. This refers to producers of wrappings, used motor oil and solvents and, in the future, even to cars which have to be taken back by their producers because they know best about the contents and composition of their commodities. Leaving these property rights components with the producer saves and even creates information about causal connections of environmentally relevant side effects of production processes and adequate techniques to avoid or to reduce these impacts. This can be considered as a 'transparency-creating institutional arrangement' (Haberer 1996, p. 186) because every transfer of that duty to actors others than the producer would be connected with a loss of information. The same applies to motivation, because being explicitly responsible for the negative environmental effects of his production processes, as well as being entitled to appropriate positive results, will make the producer interested in environmentally friendly production.

For finding adequate governance structures for environmental co-operatives we can learn from the design principles applied to the co-operative management of common-pool resources (see, for a comprehensive description, Ostrom 1999). Another source could be the economic theory of collective action which emphasises selective incentives as a tool to avoid free riding (see Olson 1965) which may be attainable by 'mixing public and private goods' when defining the concrete tasks of the co-operative.

In the case of public goods, co-operative management of natural resources or environmental pollution abatement can increase allocative efficiency if it allows the participating individuals or farms to decide on different levels of effort according to their abatement costs and possibilities. If the amount of greenhouse gases originating from agriculture were to be reduced on a regional basis, which might be a reasonable strategy, an environmental co-operative could allow its members to make different reductions based on their different abilities to carry the abatement costs, accept income losses and to find ways of adjustment. For this purpose, the management of the co-operative could economise on the cost of negotiation and the costs of opportunistic behaviour, and it could also use compensating mechanisms or establish an internal system of tradable certificates or greenhouse gas banking.

In the case of private goods, members of agri-environmental co-operatives could benefit from economies of scale when purchasing inputs like big amounts of plants and seeds or investing in equipment or infrastructure. Furthermore, agri-environmental co-operatives 'can generate positive external economies for group members. These economies relate to the collection and sharing of information and expertise, the formation and reinforcement of expectations, the promotion of a climate of innovation, and the exploitation of

economies of scale' (OECD 1998, p. 15). Collecting, processing and evaluating information can be achieved more economically by a group which can also hire specialists than separately by individuals, and the same is true for administrative tasks, solutions to legal questions, and bargaining with others. In this way, agri-environmental co-operatives can become an additional element in the institutional environment of farms and in the networks existing within rural areas.

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