Institutional Economics Analysis of Contractual Arrangements;

Managing Wildlife and Landscape on Dutch Farms

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INSTITUTIONAL ECONOMICS ANALYSIS OF CONTRACTUAL ARRANGEMENTS; MANAGING WILDLIFE AND LANDSCAPE ON DUTCH FARMS

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INSTITUTIONAL ECONOMICS ANALYSIS OF CONTRACTUAL ARRANGEMENTS; MANAGING WILDLIFE AND LANDSCAPE ON DUTCH FARMS

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VOORWOORD

Iets meer dan vier jaar geleden ben ik begonnen aan mijn promotieonderzoek op het terrein van contracten voor agrarisch natuurbeheer. Het voorliggende proefschrift toont aan dat ik tot een afronding ben gekomen. Ik heb zelf altijd met veel plezier aan dit proefschrift gewerkt en het doen van onderzoek heeft mij de mogelijkheid geboden om mijzelf uit te leven in de wetenschap.

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Chapter 1

The scope of the study

1.1 Introduction

In addition to marketable goods such as food, raw materials, and ornamental plants the agricultural sector also produces 'non-marketable' goods like wildlife and landscape. These goods are the result of a specific way of using agricultural land. Agricultural landscapes known as 'small-scale landscapes', characterised by small fields surrounded by hedges or wooded banks, or peatland areas with narrow plots and wide ditches, are the product of farming where land use is relatively capital-extensive and labour-intensive. In the Netherlands, the agriculture of the first half of the 20th century can be characterised by this type.

After 1950, the rise in wages induced labour-saving and production-enhancing techniques in agriculture, which increased agricultural output and helped the dwindling number of farmers achieve incomes comparable to those outside the sector. A higher level of mechanisation, intensification of land use, and specialisation at the farm and regional level accompanied the changes in agriculture. As a result there was deterioration of wildlife and landscape and in the quality of soil, water and air. While agriculture experienced these developments, higher incomes increased the demand for wildlife and landscape, leisure and outdoor recreation. Thus during a time when the supply of wildlife and landscape decreased, the demand for these amenities actually increased (Oskam and Slangen, 1998: 113). Adjusting to this demand, the land-use pattern in rural areas in the Netherlands underwent a change.

Changing agricultural practices (more mechanisation, intensification of land-use and specialisation at the farm and regional level) and non-agricultural developments (urbanisation and land-buying by the government for wildlife and landscape preservation) determine the land-use pattern in rural areas. This thesis focuses on a kind of land use in which agriculture is

combined with wildlife and landscape management. In the Netherlands, farmers manage wildlife and landscape mainly in the following two contractual arrangements:

1. A direct contractual arrangement between individual farmers and a principal (an entity such as a governmental agency or large wildlife and landscape preservation organisation).
2. An indirect contractual arrangement with a principal through environmental co-operatives (organisations of farmers). In this case the environmental co-operative has contractual arrangements with both farmers and a principal.

The direct contractual arrangement has a relatively long history in the Netherlands. In 1974, the Dutch government decided to develop regulations with the objective of improving the relation between agriculture, wildlife and landscape. Management contracts were instruments for achieving this objective. These contracts were meant to provide a suitable financial compensation for managing wildlife and landscape in agricultural areas. A key characteristic of the contracts is their voluntary nature, though defaulting on contracts may be subject to a penalty, which can involve the return of payments received. A policy paper presented to the Dutch parliament in 1975 resulted in the first regulation in 1977. After its introduction, the regulation was adapted more than once. For instance the number of management provisions was reduced; the system of financial rewards was standardised; administrative procedures changed; contract duration was reduced from 6 to 5 years; and compensation was added for organisational activities.

During the first years hardly any contracts were signed. In the period 1981-1999, the number of contracts and the number of farmers involved grew respectively by about 22 % and 25 % per year. In 1999 about 11.000 farmers in the Netherlands; contracts covered about 65.000 ha, and expenses on compensation payments totalled about € 27 million (Dienst Landelijk Gebied (DLG), 2000: 18-21).

The indirect contractual arrangement is of more recent date. At the beginning of the 1990s the first environmental co-operatives were legally founded. These co-operatives were groups of farmers co-operating with the aim of preserving wildlife and landscape and combining this activity with farming. The co-operatives were initiated by the farmers and had to establish their own role in their working areas. In 1999 the total number of farmers involved in environmental

co-operatives was about 6600 belonging to about 80 organisations which covered an area of about 134.000 ha.

1.2 Subject of the study

The subject of this study is an analysis of the combination of agriculture and wildlife and landscape management in the Netherlands, and especially, the organisation of the supply-side of wildlife and landscape management on Dutch farms. Of central importance is the design of contractual arrangements in which farmers are involved. The demand for wildlife and landscape is exogenous to this study. Governmental agencies and/or private organisations willing to conclude contracts with farmers for wildlife and landscape management are assumed to be present. The study focuses on contractual arrangements in which participation of farmers is voluntary. Other arrangements like direct regulation are not a topic of this study. However, this does not mean that other arrangements could not produce the same effect or even be more efficient. The question whether the contracts between farmers and contractors contribute to the quality of wildlife and landscape is also beyond the scope of this study.

The objective of this thesis is to analyse the design of contractual arrangements for wildlife and landscape management. From this broad objective three specific objectives are defined and developed in the subsequent parts and chapters. The first objective is to develop a framework for analysing contractual arrangements for wildlife and landscape management by farmers. The second objective is to analyse contractual arrangements for wildlife and landscape management between a governmental agency and individual farmers. The third objective is to analyse the role of the intermediary organisations between individual farmers and the government, or large wildlife and landscape preservation organisations. This leads to the following research questions:

1. What is a suitable framework for analysing the design of institutional arrangements?
2. What elements of contract design can be distinguished?
3. What are the explanations for the decision to conclude contracts for wildlife and landscape management by farmers?

4. What are the effects on Dutch farms of concluding contracts for wildlife and landscape management?
5. How can environmental co-operatives be characterised?
6. How can the institutional design of environmental co-operatives be characterised and analysed?

To answer these questions a "literary" method combined with survey research is used. A literary approach is based on theory and makes use of close reasoning. Further, in order to answer questions 2 ad 3, formal models focussing on the decision to contract and the consequences of contracting on the farm level are used.

1.3 Outline of the study

This thesis consists of four parts: (I) institutional economics analysis; (II) contractual arrangements involving individual farmers; (III) environmental co-operatives for managing wildlife and landscape and (IV) a synthesis.

In Part I a framework for analysing institutional arrangements is developed. Further this framework is tailored to analysing institutional arrangements for combining agriculture and wildlife and landscape management. Part I starts with Chapter 2 introducing the theoretical background for analysing institutional arrangements. In Chapter 3 the analysis of institutional arrangements will be applied to wildlife and landscape management by farmers. Part I finishes with Chapter 4, containing a description and discussion of the methodology applied in this thesis.

Part II deals with contractual arrangements for wildlife and landscape management involving individual farmers. This means that the framework developed in Part I will be applied to contractual arrangements between two parties: individual farmers and the government. Chapter 5 examines contract design from a New Institutional Economics point of view. The contractual arrangements in which individual farmers are involved are analysed. The second chapter in Part II looks at the management of wildlife and landscape within the context of farming. To do this, an empirical economic model of production behaviour in dairy farming will be developed and elaborated. For this purpose an extra theoretical restriction is made: dairy farmers maximise

profits in the short run, while facing technical and institutional restrictions.

The third part of the thesis concentrates on the application of the framework developed in Part I on groups of farmers having the objective of managing wildlife and landscape. In the first chapter of Part III, New Institutional Economics is applied to analyse explanations for, and activities of, environmental co-operatives, including the existing situation of environmental co-operatives in the Netherlands. In the second chapter of Part III, New Institutional Economics is used to analyse the relation between the (external) institutional environment and the (internal) governance structures of environmental co-operatives, and to examine club aspects of environmental co-operatives. The institutional environment consists of formal and informal rules in a society. The third chapter of Part III explores ways (or design principles) to reduce the number of problems resulting from incomplete information on wildlife and landscape management within an environmental co-operative. The goal of this chapter is to contribute to the development of a theoretical framework for self-organising and self-governing forms of co-operation in the management of wildlife and landscape by farmers.

In Part IV, the thesis will finish with synthesis concerning the thesis. Chapter 10 integrates the preceding chapters into a broader context of policy relevance.

PART I INSTITUTIONAL ECONOMICS ANALYSIS

Chapter 2

Analysing institutional arrangements: theoretical background

2.1 Introduction

The main theoretical basis for analysing institutional arrangements in this thesis is the New Institutional Economics. Two important concepts in New Institutional Economics are the institutional environment and institutional arrangements. They are central concepts for analysing wildlife and landscape management by farmers in this thesis. The institutional environment deals with the 'rules of the game' that guide individuals' behaviour. It is the set of fundamental political, social, and legal ground rules that establishes the basis for production, exchange and distribution (Davis and North 1971: 6). Rules that govern elections, property rights, and the right to contract are examples.

Institutional arrangements (governance structures) are the play of the game, the activity. According to Ménard (1995: 175) an institutional arrangement is a way to implement and operationalise the 'rules of the game'. The institutional environment mainly defines (or acts as a constraint on) the environment of the institutional arrangements (cf. Williamson 1996: 5). An institutional arrangement is an arrangement between economic units that governs the ways in which units can co-operate and/or compete. The arrangement may be either formal or informal, temporary or long-lived. The arrangement may involve a single individual, a group of individuals co-operating, or the government (alone or in co-operation with others) (cf. Davis and North 1971: 7).

This chapter starts with an introduction to the New Institutional Economics approach for analysing institutional arrangements in Section 2.2. Section 2.3 examines the main characteristics of the institutional environment. The central question to be analysed in this chapter is: what are the main components of institutional arrangements from an institutional

economics point of view? This question is central to the analysis and design of institutional arrangements for wildlife and landscape management by farmers and is analysed in Section 2.4. In Section 2.5 contracts and contract types are analysed. The chapter finishes with a summary and conclusions.

2.2 A New Institutional Economics approach to analysing institutional arrangements

The main theoretical basis of this thesis is the New Institutional Economics. The central proposition of institutional economics is that institutions matter (see for instance Furubotn and Richter, 1997: 1; North, 2000:7, Williamson, 2000a: 595). A fundamental idea animating New Institutional Economics is that transaction costs exist and necessarily influence the structure of institutions and the specific economic choices people make. The transaction costs, boundedly (i.e. not complete rationality) rational individuals and the existence of opportunistic behaviour are among the main features that distinguish it from the standard Neoclassical point of view. Bounded rationality means that is will be costly for individuals to contemplate every contingency that might arise over the course of a transaction (Kreps, 1990: 744). Opportunistic behaviour means that individuals are self-interested with guile (Williamson, 1985: 30). If it will benefit them, opportunistic individuals will break any of the commandments (Kreps, 1990: 744). Opportunism refers to the willingness of transactors to renege on promises, cheat on agreements, shirk responsibilities, circumvent rules, search for loopholes, or otherwise exploit the vulnerabilities of a trading partner in hopes of getting more benefits from the exchange. Of course, not everyone is so unprincipled, but bounded rationality makes it difficult to distinguish the trustworthy from the unscrupulous, making guarding against opportunism the prudent course (Masten, 1996: 6).

New Institutional Economics is at times referred to as the New Theory of Organisation (cf. Furubotn and Richter 1997: 29). New Institutional Economics partly overlaps and in some areas extends Economic Organisation Theory (see for instance Milgrom and Roberts 1992)[1].

The New Institutional Economics approach came about as the result of groundbreaking studies in various sub-fields of what is now known as modern Institutional Economics (Furubotn and Richter 1997: 30-31). Figure 2.1 gives an overview of the sub-fields of New Institutional Economics distinguished in this thesis, although other classifications of the sub-fields are possible (see for instance North, 1986: 235 and Foss and Foss, 2001: 9). The dashed lines illustrate that the sub-fields are not isolated, but related to each other.

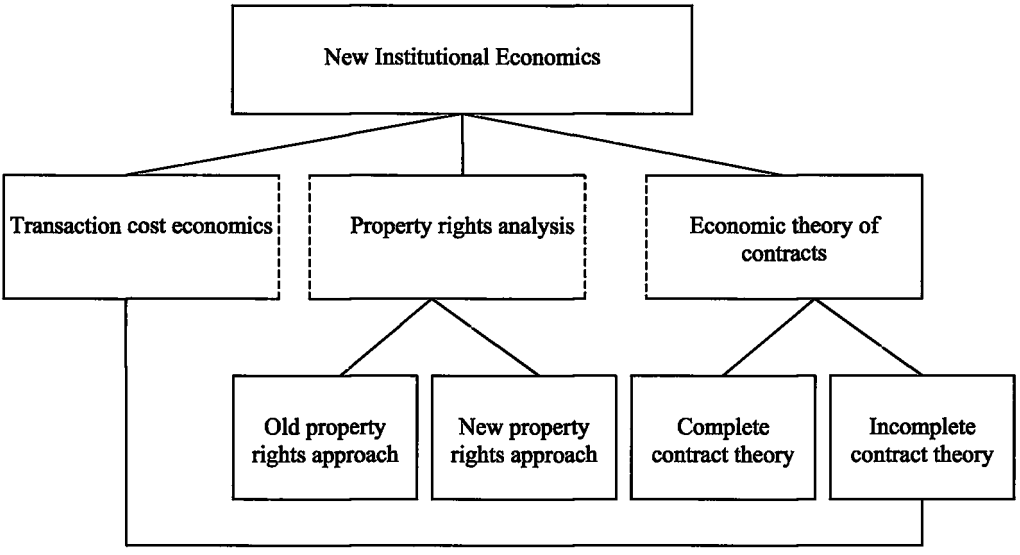

Figure 2.1: Overview of New Institutional Economics

[1] Eggertsson (1990: 6) distinguishes New Institutional Economics from Neo-Institutional Economics. Neo Institutional Economics constitutes a modification of the protective belt of neo-classical economics, primarily, by introducing information and transaction costs and the constraints of property rights. New Institutional Economics rejects elements of the hard core of neo-classical economics, such as the rational choice model. Further, New Institutional Economics has to be distinguished from Old Institutional Economics (see for instance Groenewegen (2000): 39, Groenewegen, et al. (1995): 468-470, and Hodgson (1998) for discussions of Old Institutional Economics).

The first sub-field of New Institutional Economics is transaction cost economics. The main message of transaction cost economics is that transaction costs arise in connection with the exchange process, and that their magnitude affects the ways in which economic activity is organised and carried out (cf. Furubotn and Richter, 1997: 31). Examples of categories of transaction costs are search and information costs, bargaining and decision costs, and pricing and enforcement costs. The central idea of Williamson is that when any transaction is described in terms of three key dimensions, it maps the most efficient institutional arrangement (Hölmstrom and Roberts, 1998: 76). These dimensions are frequency, uncertainty and asset specificity (Williamson, 1996: 59).

The second sub-field is property rights analysis. Foss and Foss (2001) distinguish two different approaches to property rights: the 'old property rights approach' and the 'new property rights approach'. The old property rights approach consists of work of Alchian (1977), Demsetz (1988), and Barzel (1997). Much of this work was taken up with identifying differences between alternative systems of property rights as alternative ownership arrangements (Foss and Foss 2001: 19). Two main ownership arrangements are collective and private ownership. The key concern of the new property rights approach is the issue of why it matters who owns an asset. Exponents of this approach are Grossman and Hart (1986) and Hart (1995).

However, the literature on the new property rights approach is also sometimes referred to as the incomplete contracting literature (see Tirole, 1999: 745). In this stream the agents are assumed to behave rationally. Unfortunately there is no clear definition of incomplete contracting in the literature (Tirole 1999: 743). Incomplete contracts are contracts that do not try to take into account all future contingencies, because of incomplete foresight of what the future will bring. Incomplete foresight makes it impossible to take all future contingencies into account when writing a contract. Uncertainties and unobservables make contracts unavoidablebly incomplete. The parties to a contract have to allocate residual control rights - i.e. the rights to make decisions in circumstances not fully foreseen in the contract. The owner of an asset has the residual control rights over that asset: the right to decide all usages of the asset in any way not inconsistent with prior contract, custom or law. The possession of residual control rights is taken virtually to be definition of ownership (Hart, 1995: 30). The new property rights theory addresses the question of how these contracts can be allocated efficiently.

A number of ideas follow from the New Property Rights approach/incomplete contracting literature (cf. Tirole, 1999: 749-751):

- the allocation of property rights determines the bargaining powers in the ex-post determination of the terms of trade and that the holders of property rights are somewhat protected against the expropriation of their specific investment;
- the exercise of property rights is limited by the indispensability of the other party in the *ex post* production process;
- the allocation of property rights may affect the efficiency *ex post* trade. Bargaining under asymmetric information may lead to inefficient haggling or sub-optimal trade;
- clusters and splits of multiple decision rights are governed by incentive considerations. For instance Hart (1995: 47-49) argues that highly complementary assets should be owned in common. Concentrating the rights in a single hand reduces the risk of hold ups.

The third main sub-field of New Institutional Economics is contract theory. Since the 1980s there has been a growing interest in contract theories of various kinds. According to Hart and Holmström (1987: 71), this development is partly a reaction to our rather thorough understanding of the standard theory of perfect competition under complete markets, but more importantly a reaction to the resulting realisation that this paradigm is insufficient to accommodate a number of important economic phenomena. Contracts provide the foundation for a large part of economic analysis. Any transaction must be mediated by some form of contract, whether it be explicit or implicit. In the case of spot trades, where the two sides of the transaction occur almost simultaneously, the contractual element is usually downplayed, presumably because it is regarded as trivial. In recent years, economists have become much more interested in long-term relationships where a considerable amount of time may elapse between signing the contract and transaction. In these circumstances, a contract becomes an essential part of the (trading) relationships.

The approaches to contractual arrangements can be structured along different lines. One approach predominant in recent literature emphasises the formal analysis of contracts, and focuses on conditions that would determine an optimal contract, i.e., a contract that could

fundamentally be self-enforcing (cf. Ménard, 1997: 1). The principal/agent theory belongs to this branch of research. In the standard principal/agent model the parties negotiate only once and on a once-and-for-all basis. Under certain assumptions the principal can determine a result-dependent remuneration plan for the agent. Moreover, the situation created is one in which the agent maximises not only his own but also the principal's utility. One of the assumptions is that, after the contract is concluded, both parties fulfil their obligations without problems. This approach is also called the theory of complete contracts (see among others Mas-Colell et al., 1995: 436-510; Salanié, 1997; 4-7; Furubotn and Richter, 1997: 181-182). Complete contracting can be characterised by complete contingent contracting which means that all variables that may have an impact on the conditions of the contractual relationship during its whole duration have taken into account when negotiation and signing the contract (cf. Salanié, 1997: 150). This means that the contract is perfectly contingent on all these variables. Impediments to perfectly contingent contracting are:

- agents may have private information at the date of contracting (adverse selection);
- agents receive information that cannot be directly verified by contract enforcement authorities (hidden knowledge);
- agents may take actions that cannot be verified (moral hazard) (cf. Tirole, 1999: 754).

In perfectly contingent contracting there is no limitation on the parties' ability to foresee contingencies, to write contracts, and to enforce them (Tirole, 1999: 754).

Despite the variety of settings in which risk sharing, moral hazard, and adverse selection are potentially important, complete contract theory's performance, as a positive theory has been disappointing. Complete contract theory failed to account for the observed simplicity of sharing rules in most real-world contracts. Complete contract theory has also been faulted for its inability to distinguish between, and therefore account for the choice between contracting and other institutional and organisational forms such as property rights and the firm (cf. Masten, 1998: 5). However, this does not mean that the results of complete contract theory are useless for this thesis. The complete contract literature is used for giving insight into contracting mechanisms.

The other approach to contractual arrangements focuses on the incompleteness of contractual arrangements, based transaction cost economics. The implementation of these

contractual arrangements and their enforcement necessitate "filling in the blanks" and imposing constraints on the partners involved (cf. Ménard, 1997: 1). Under the influence of the work of Williamson (1985, 1996, 1998) a significant change was made; emphasis was placed on incomplete contracts. This kind of incomplete contract theory has its basis in transaction cost economics. An important objective of incomplete contracting is to overcome the ex post contractual opportunism that may result from the difficulties courts or other third parties face in verifying the execution of contractual obligations. Credible commitments and self-enforcing commitments are important topics in this field (Furubotn and Richter, 1997: 31-32). Authors in this field are Ménard (e.g. 2000) and Williamson (e.g. 1985; 1996; 1998; 2000a). According to Hölmstrom and Roberts (cf. 1998: 74-75) this theory has to be distinguished from the more formal new property rights approach. The detailed logic of both theories differs, resulting in quite different empirical predictions.

2.3 The Institutional Environment

Williamson (1998: 27) defines the institutional environment as the rules of the game in which economic activity is organised. Above the level of the institutional environment there exists a level called the social embeddedness level. This is where informal institutions, customs, traditions, norms, etc. are located. This level is taken as given by most institutional economists (Williamson, 2000a: 596). In this thesis the level of social embeddedness is taken as part of the institutional environment. Several studies have shown that the institutional environment matters for the variability of contracts in relation to their transactions; there exist different arrangements in the same environment; and that the institutional environment influences the performance and duration of contracts (cf. Ménard, 2000: 236). It is not easy to obtain measures of relevant dimensions of the institutional environment in order to isolate its impact on institutional arrangements (Oxley 1999: 284). The institutional environment is analysed by using the following three characteristics;

1. place: the institutional environment differs among communities;
2. time: the institutional environment is not fixed in time and changes in general slowly;

3. level: the institutional environment operates at an aggregate level.

The first characteristic is that the institutional environment differs among different communities (e.g. countries, provinces, and regions). For instance, the existence of norms in the society as a part of the institutional environment in which an organisation is active influences the relative performance of this organisation. The main role of norms is that they lead people to perceive the 'game' of social life as a kind of generalised assurance game: by contributing to a public good, an individual manifests his willingness to share in the life of the group, and his understanding that everyone has to participate at some level in collective efforts to make the group viable (cf. Baland and Plateau, 1996: 119).

A second characteristic is that the institutional environment is not constant in time. According to Williamson (1998:27, 2000a: 596) the institutional environment changes considerably in a period of 10 - 100 years. In a single community only changes in the institutional environment in time can be observed. For instance, the recognition of property rights (part of the institutional environment) is not immutable. They may, for example, change from one generation to another (Cooter and Ulen, 1997: 72). This can have consequences for the way in which the government recognises and protects assets. Property is a bundle of rights which describe what people may and may not do with the resources they own; the extent to which they may possess, use, transform, transfer, or exclude others from their property. The environment can also be altered (cf. Davis and North, 1971: 7). Property rights can be changed by changes in law. It is important to realise that since the institutional environment changes only slowly and in complex ways, comparative static analysis in a single regional or country setting is problematic (see Oxley, 1999: 284). In this study the institutional environment is taken as given.

The third characteristic is that the level of analysis is at an aggregate level. Institutional arrangements operate at the level of individual transactions whereas the institutional environment is more concerned with composite levels. For instance, the legal system is a framework which defines the ways in which property rights can be implemented and enforced (Ménard, 1995: 164). Contract law as a part of the legal system can help people to co-operate by enforcing, interpreting and regulating promises (cf. Cooter and Ulen, 1997: 202). Contract law is relevant to all kinds of institutional arrangements, ranging from wildlife and landscape management contracts, employment contracts to house renting contracts. Individuals in a society

are often involved in more than one arrangement. This can be between individuals, between individuals and organisations, or institutional arrangements between organisations.

Law and the judiciary are reflected in constraints that originate in the institutional environment (cf. Williamson, 1996: 327). Laws that regulate transfers, as well as the procedures and mechanisms for implementing and enforcing these laws, are central to the effectiveness of contracts (Ménard, 2000: 247). Wildlife laws assign property rights to various attributes of wild species; they specify ownership of certain wildlife attributes to private individuals, local governments, states, federal agencies, and international organisations (Lueck, 1989: 303).

This thesis focuses more on institutional arrangements than on the institutional environment itself. Attention is paid to relations between the institutional environment and institutional arrangements. The institutional environment or rules of the game has consequences for analysing institutional arrangements and determines the feasibility and optimality of institutional arrangements due to their characteristics in place, time and level. Perfect institutional environments do not exist; for instance court order issuing procedures are not perfect. Public ordering defines rules of the game for private ordering and a series of mechanisms explicitly designed to enforce contracts and to support transactions (cf. Ménard, 2000: 246). But courts are costly, much contract management and dispute settlement is worked out privately by the parties (cf. Williamson, 2000a: 599).

2.4 Institutional arrangements

In a society there exist all kinds of arrangements between individuals, individuals and groups or between groups. An institutional arrangement has to be designed to accomplish at least one of the following goals:

- to provide a structure within which its members can co-operate to obtain some added income that is not available outside that structure;
- or to provide a mechanism for changing laws or property rights so that individuals or groups can legally compete in new ways (Davis and North: 1971: 7).

In this thesis organisations and contracts are seen as 'institutional arrangements' (see also Ménard, 2000: 238). When organisations are seen as institutional arrangements (organisational constructions) the internal structure has economic purpose and effect (cf. Williamson, 2000a: 602). Ménard (1995: 172) characterises an organisation as institutional arrangement designed to make possible the conscious and deliberated co-ordination of activities in identifiable boundaries, in which members associate on a regular basis through a set of implicit and explicit agreements, commit themselves to collective actions for the purpose of creating and allocating resources and capabilities by a combination of command and co-operation.

An institutional arrangement is more than a formal contract: an arrangement consists of a contract and other forms of co-ordination. If one looks carefully at actual contracts in organisations, it is possible to identify several complementary procedures that co-ordinate economic activities, most of which do not involve the price system (Ménard, 1994: 244). Command (hierarchy) is only one of the ways to allocate resources in an organisation. In Principal agent theory contracts (agency contracts) do not represent any specific institutional arrangement. According to Ménard (2000: 237-238) it is typically the realm of agency theory which considers forms of contractual arrangements as a continuum. Agency theory continuously seeks the optimal contract which include built-in mechanisms making further enforcement procedures unnecessary. There is no need for an enforcement procedure other than the built-in mechanisms.

The standard microeconomic theory focuses on the market as the mechanism for co-ordinating economic transactions. In the extreme case there are no firms or organisations apart from the market system itself. It is the analysis of a system of extreme decentralisation (Coase, 2000: 3). Autonomous agents are induced to make mutually compatible plans and are not required to do other than what they deem in their own best interest. Individuals exercise foresight and choose between alternatives. The system assumes that everyone knows what the prices are and when goods can be bought and sold. The theory assumes further that the allocation of resources is dependent directly on the price system. Coase (1996: 90) argues that an economist thinks of the economic system as being co-ordinated by the price mechanism and becomes not an organisation but an organism. The economic system "works itself". There is no need to study institutions that let the market "work".

A market equilibrium can be identified as an outcome of a market economy in which each agent in the economy (i.e. each consumer and firm) is doing as well as possible given the actions of the other agents. The price system achieves this efficient allocation of resources without requiring communication among individual decision-makers of anything more than the summary information about the economy embodied in the prices. The First Welfare Theorem provides a set of conditions under which it can be assured that the market economy will achieve a Pareto-optimal result. An economic outcome is Pareto-optimal if it is impossible to make individuals better off without making any other individual worse off. The Second Theorem states that under the same set of assumptions - the first welfare theorem plus convexity conditions - all Pareto-optimal outcomes can in principle be implemented through the market mechanism. That is, a public authority who wishes to implement a particular Pareto-optimal outcome may always do so by appropriately redistributing wealth and "letting the market work" (cf. Mas-Colell et al., 1995: 307-308). If the competitive equilibrium of the Neoclassical model provides a good and complete description of how markets work, there is no need for other economic organisations aiming at improving economic efficiency, although political organisation might still exist in order to bring more equity into the system.

In standard microeconomic theory, the market is the fundamental and exclusive institutional arrangement for co-ordinating economic activities (cf. Ménard 1995: 169). Any inefficiency that arises in a market economy, and hence any role for Pareto-improving market intervention, must be traceable to a violation of some of the assumptions of the Welfare Theorems. In that case the market equilibria fail to be Pareto-optimal and market failures will be present. When the economic environment departs significantly from the artificial Neoclassical pattern, would-be profit maximising firms and utility-maximising consumers do not suffice to bring the ideal of Pareto efficiency, or even constrained Pareto optimality (Furubotn 1999: 187). However, as long as transaction costs are positive and large, there is no way by which to define an efficient solution with any real meaning, because there is no way of specifying what an efficient "government" is underlying the economic structure op property rights. Without being able to specify an efficient government, we really cannot talk about Pareto efficiency (cf. North 1986: 236).

Alternative to the market mechanism would be a situation where the price system is eliminated by a system of explicit hierarchical organisation. Hierarchy in institutional

arrangements obviously serves a co-ordinating purpose, performing functions that could be co-ordinated instead through the pricing mechanism (cf. Medema 1996: 572). A hierarchy is responsible for the ordering of transactions in an institutional arrangement: for example, deciding what transaction should be organised at what point in time (cf. Ménard, 2000: 245). With hierarchy, formalisation is essential: if there are divergent opinions about a course of action is must be clear whose decision will prevail (Ménard, 1996: 157). It is the discretionary power of the management - ultimatedly the owners of the assets or their representatives - that prevails in initiating and terminating contracts, in determining and reconfiguring tasks, and in allocating resources among departments (cf. Ménard, 2000: 245). Generally speaking, hierarchical relations fail when discretionary power deteriorates into arbitrariness (Ménard, 1996: 244-245). A limitation to hierarchical relations is that the ability to impose constraints on the choice of subordinates is quite limited. Subordinates can resist by implementing decisions imperfectly, by failing to put a specific decision into operation or by outright rebellion against the hierarchy, as when they quit or go on strike.

Both market and non-market failure can be viewed as resulting from the particular transaction cost characteristics and burdens associated with markets and organisations (which include governments) as alternative institutional arrangements for organising economic activities (Wolf, 1993: 7). In comparison to the study of market failure, the study of hierarchy failure is seriously underdeveloped (Williamson, 1996: 17). The behaviour and deficiencies of hierarchical organisations should be included in a comprehensive theory of non-market failure that can highlight similarities and differences among them, as well as permit suitable comparisons between the market and the market sector (cf. Wolf, 1993: 6). This thesis attempts to assess how institutional arrangements can successfully deal with the combination of agriculture and wildlife and landscape management.

A major contribution of recent literature on transactions is the demonstration of the fundamental importance of 'hybrid forms' observed between the two polar cases of markets and hierarchies. Specific combinations of market incentives and modalities of co-ordination involving some form of hierarchical relationship characterise hybrid forms (Ménard, 1995: 175). They necessarily involve some forms of planning and administrative decision, both with and among the firms concerned (Ménard, 1996: 157). Hybrid forms develop for dealing with bi- or multilateral dependence, when this dependence is strong enough to require close co-ordination

but not strong enough to induce full integration (or when integration is not possible, e.g., when prohibited by regulations) (Ménard, 1998: 410). However the hybrid form of organisation is not a loose amalgam of market and hierarchy but possesses its own disciplined rationale (Williamson, 1996: 119). This arrangement is co-ordinated and conducted by active forms of governance emanating from the partners and operating through authority. Authority should be distinguished from hierarchy. With authority there is a continuously renewed agreement on the transfer of capacities to make decisions, while in hierarchies the power to make decisions is discretionary and rooted in rights that are exogenous to subordinates (cf. Ménard, 1994: 244). The literature on hybrid forms has emphasised features of the contractual aspect, such arbitration clauses, take-or-pay procurement, reciprocity, and measures to create hostage positions (Ménard, 1996: 157).

Authority relations differ in several aspects from hierarchies. The ability to co-ordinate through hierarchy is a privilege embedded in an institutional arrangement. The essential difference is that hierarchy is backed by a specific institutional arrangement; this may or may not be the case with authority (Ménard, 1996: 155). Authority can be formal when explicitly delineate by rules, or informal when it depends solely on personal influence (Ménard, 1994: 234). Authority is closely associated with a specific person. Several factors favouring the effectiveness of authority can be distinguished (cf. Ménard, 1994: 239-240):

- a certain level of expertise;
- access to information not generally available;
- ability to control or renegotiate the allocation of resources;
- a strategic position in a process;
- qualitative factors like personality and leadership aptitude.

Hierarchy involves the capacity to supervise and to control, the right to make decisions (cf. Ménard, 1994: 237), and depends more on position and status than authority, which requires mutual consent and commitment in order to be efficient (Ménard, 1996: 180-181). Non-hierarchical co-ordination can be viewed as horizontal co-ordination.

Three categories of institutional arrangements are distinguished in this thesis: markets; hierarchies; and hybrids. As summarised in Table 2.1, incentive intensity (price) plays an

important role within markets but is of no importance in hierarchical organisations, whereas administrative controls are.

Table 2.1: Distinguishing characteristics of markets, hybrids and hierarchical institutional arrangements

	Institutional arrangement		
	Market	Hybrid	Hierarchical organisation
Instruments:			
• Incentive intensity (prices)	++	+	0
• Administrative controls (hierarchy)	0	+	++
• Authority	0	++	0
Adaptation:			
• Autonomy	++	+	0
• Co-ordination	0	+	++
Enforcement			
• Contract law	++	+	0
• Private enforcement	0	+	++
Residual control rights	clear	not clear	clear

* ++ = *important;* + = *less important; 0 unimportant*
Source: partly based Williamson (1996: 105)

The hybrid form is located between the other two institutional arrangements and the main instrument is authority. The choice of adaptation mode depends whether or not there is bilateral dependency between the contracting partners, and the determination of the distribution of the gains of trade between the partners (cf. Ménard, 1996: 160). When significant disturbances of the environment and bilateral dependency develop, transactions cost economics predicts that delay in responding will decrease the efficiency of the price system. Further, there is an increased possibility that opportunistic behaviour of the contracting parties will considerably reduce the efficiency of the price mechanism. Compared to market relationships, hybrid forms represent a shift towards co-operation and administrative controls in order to adjust more rapidly and in a more co-ordinated way to these disturbances (cf. Ménard, 1996: 159). But this shift also weakens the monetary incentives that are the strength of the market, without providing the incentives of hierarchical structures (e.g. promotions or extended powers of decision). Because

of the limited role of the price mechanism and uncertainties surrounding appropriation of rents, information disclosure is essential to the existence and stability of hybrid forms (cf. Ménard, 1996: 159).

A fundamental explanation for the existence of hybrid forms is that they enhance the capacity of firms to deal with disturbances that spot-markets cannot easily meet or could only at prohibitive costs, while maintaining the incentives that pure integration lacks (Ménard, 1996: 161). According to Williamson (cf. 1996: 101-105), the central problem of economic organisation is adaptation to changing circumstances. He distinguishes two types of adaptations: (1) when prices serve as sufficient information and (2) by co-ordination within internal organisations. Changes in the demand or supply of a commodity are reflected in price change, in response to which participants are able to take the right action. Williamson (1996: 102) refers to adaptations of this kind as autonomy adaptations. This is the Neoclassical ideal in which consumers and producers respond independently to parametric price changes so as to maximise their utility and profits respectively. Some disturbances, however, require co-ordinated responses. Failures in co-ordination can occur when autonomous parties read and react to signals differently, even though their purpose is to achieve a timely and compatible combined response. Williamson (1996: 103) refers to adaptations of co-ordination as co-operation adaptations (see Table 2.1). Compared with the spot market, a formal organisation orchestrating co-ordinated adaptation to unanticipated disturbances enjoys adaptive advantages as bilateral dependency builds up.

Enforcement differs for the various institutional arrangements. A distinctive form of contract law supports each generic mode of governance (Williamson, 1998: 37; cf. Ménard, 2000: 248). Contract law is important for markets because this type of governance assumes that laws can solve most conflicts. In case of markets there are relatively stable conditions because there are no consequential discrepancies before and after the transaction and therefore simple self-enforcing mechanisms can be designed (cf. Ménard, 2000: 241). Enforcement mechanisms are designed to adjust to relatively unstable conditions, i.e. consequential uncertainties. These mechanisms can be formal or informal. (Ménard, 2000: 241).

In the case of hybrid forms we have to deal with more or less equal members who work together in an organisation which makes use particularly of forms of horizontal (non-price) co-ordination. The hybrid institutional arrangement typically comprises:

1. contractual arrangements defining a framework for efficient co-ordination with embodied adaptation mechanisms;
2. specific incentive mechanisms for allocation of residual rights in a structure in which ownership is separate and all rights cannot be specified by contracts;
3. Particular forms of control and adaptation (because the price mechanism plays a limited role as a vector of adaptation, and there is no hierarchy to decide in favour of one partner against others) (Ménard, 1999: 410).

The legitimacy of hybrid forms depends on the mutual and renewable consent of participants (cf. Ménard, 1999: 410). The basis elements of the co-ordination mechanism are commitment, trust, reputation, standardisation of norms or beliefs, and shared codes of conduct. Members largely maintain the property rights over their assets, but some of the attributes of the assets are or become common property. This implies that the residual control rights are not clear.

In contrast to hierarchical co-ordination - that is mostly vertical - horizontal non-market co-ordination is based on elements of motivation, trust and commitment. The co-ordination mechanisms that are used in such an organisation are *mutual adjustments* and the *standardisation of values and norms.* Mutual adjustment refers to the co-ordination achieved by informal horizontal communication. Standardisation of norms and values means shared codes of conduct usually for the entire organisation, so that everyone functions according to the same norms of behaviour. To work effectively, such a horizontal organisation could be partly based on formal rules, but they must be complemented by informal rules (sanctions, conventions, norms or codes of behaviour) that reduce enforcing costs (cf. North, 1993: 20; see also Douma and Schreuder, 1998: 140-143).

Standardisation of values and norms in organisations leads to common values and norms. Common values and norms pertain to a congruent set of preferences in a group of people. Common values of norms form guiding co-ordination principles among a group or community. Most people work in an organisation of some kind. Almost everyone grows up in an organisation called the family. There is a variety of groupings in which people interact for various reasons. The most important characteristic of such an organisation is that the members co-operate under forms of agreements. This agreement may be based on a formal contract, a quite informal contract, mutual expectation, or just on bonds of kinship as in a (possibly extended) family.

Repeated interaction promotes solidarity, consensus, trust, and common values and norms in a group.

Dasgupta (1991: 75, 79) interprets social norms as implicit social contracts to co-operate, embedded in customs and rituals and resulting from repeated interactions. If people are not extremely myopic, it is the self-interest of each member of the group to keep to the norms, in other words, they are self-enforcing. Common values and norms diminish the incidence of opportunistic behaviour between the members of the group. Effective co-ordination based on common values and norms coincides with a strong motivation and commitment of individual members of a group to achieve their common goal (CPB, 1997: 55).

Nooteboom (1999: 24- 25) emphasizes the role and meaning of trust. Trust can lower the costs of search and verification because trusting people are less secretive and more readily supply information, and the costs of contracting and monitoring since, reducing fears of opportunism, it leads to the acceptance of more influence from the partner. In the case of trust, people will deliberate and renegotiate on the basis of give and take ('voice') rather than walk out ('exit') when conflicts arise.

In last row of Table 2.1 the allocation of residual rights of control are used to characterise institutional arrangements. Hybrid institutional arrangements maintain separate ownership (Ménard, 1996: 159). Ownership is a bundle of decision rights. According to the new property rights approach, it is the owner of the asset in question who has the residual control rights (Hart, 1995: 30). This means that the owner has the right to use the asset in any way not inconsistent with a prior contract, custom, or any law. Owing to bounded rationality and the associated transaction costs, most agreements framing behaviour are incomplete and thus fail to determine future actions of parties exactly. Contractual incompleteness has important economic implications. Under complete contracting, the division of income in each eventuality would be specified contractually, and there would be no returns that could be considered as residual. If contracts are incomplete the allocation of power of control matters. The party that has *power of control* has also the *residual rights of control,* and the one who is entitled to receive the residual income is the residual claimant (cf. Milgrom and Roberts, 1992: 291).

According to the *new* property rights approach, it is the owner of the asset in question who has the residual control rights (see for instance Foss and Foss, 2001: 25). Residual income and residual control rights are highly complementary and it makes sense to allocate them to the same

person. However, according to Hart (1995: 64) residual income and residual control are not always bundled together on a one-to-one basis. In some cases it may not be possible to measure or to verify all aspects of an asset's return. The new property rights approach does not consider employees to be part of the firm because, given that employees cannot be owned, there is no sense in which they are any different from agents who contract with the firm at arm's length (cf. Rajan and Zingales, 1998: 388). An important characteristic of hybrid forms is that the members of such organisations maintain (for a major part) their private property rights over their land and other marketable assets.

In summary, in an economy a mix of systems is used to co-ordinate and manage various kinds of activities. The kind of co-ordination that is most effective depends on the nature of the transaction. In the approach of the New Institutional Economics, as elsewhere in mainstream economics, the preferences of agents are taken as given, exogenous, or performed. But now, in addition to agents adjusting their behaviour to prices, as in Neoclassical theory, they also do so in relation to the overall 'incentive structure' of society. In other words, legal norms, along with other formal and informal rules, impose constraints to which individual agents respond. Formal rules are an important part of the institutional framework, but only a part. To work effectively they must be complemented by informal constraints (conventions, norms of behavior) that supplement them and reduce enforcement costs (North, 1993: 20). Hence governance means more than a formal contract between two parties.

2.5 Contracts

The diversity of contractual arrangements explains the necessity of an adequate framework for analysing transactions that have diverse characteristics. Different contractual arrangements are related to different contracts for implementing, co-ordinating and monitoring different kinds of transactions. The differences among contracts correspond to the characteristics of the institutional arrangements in which they are embedded (Ménard, 2000: 248). Selection of an institutional arrangement must take into account the mutual interdependency of the institutional arrangement and the characteristics of the contracts.

Which institutional arrangement corresponds to which contract depends on the completeness and complexity of the contracts. Incompleteness results from bounded rationality, particularly if the environment is uncertain. Opportunistic behaviour makes reliance on incomplete contracts impossible (cf. Furubotn and Richter, 1997: 4). Moving from simple to complex (incomplete long term) contracts is attended by a whole series of features: the length of the contract increases, penalties to deter breach are introduced, provision is made for added information disclosure and processing, and specialised disputed settlement mechanisms appear (Williamson, 2000a: 603). Complexity has to do with the writing of contracts, and, even more importantly, with their implementation, mainly as a result of unclear residual control rights.

There is still no uniformly accepted classification of contract types. Three types of contracts (contract law) are distinguished in this thesis: classical, neo-classical and relational (for contract classifications see: Williamson, 1985: 68-72; Lyons and Metha, 1997: 48-49; Ménard, 1996: 157; Williamson, 1996: 95-100; and Ménard, 2000: 239). This approach is proposed by Williamson and has its roots in the work of Macneil (1974, 1978). Several elements are used to characterise different types of contracts. Table 2.2 gives an overview of the classification of contracts. There is overlap between the different contracts with respect to these characteristics. The first element is related to the identity of the parties to the contracts. This is unimportant for a classical contract, but crucial for a relational contract. Second, the duration of the relationship is fixed in a classical contract, while it is open-ended in relational contracts. The third element relates to how the contract is expected to deal with contingencies, i.e. the degree of completeness. The final element is enforcement in anticipation of problems in dealing with changing circumstances. There is a significant variety of enforcement procedures in contractual arrangements. The characteristics of these procedures largely depend on the level of uncertainty surrounding the transaction that a contract is designed to organise (cf. Menard, 2000: 242).

Table 2.2: Classification of contracts *

Contract type	Identity of parties	Duration	Degree of completeness	Safeguards
Classical	0	short	++	public
Neo-classical	+	medium	+	public/private
Relational	++	long	0	private

* ++ = *strong;* + = *moderate;* 0 = *weak*

A classical contract is characteristic of market relationships. The dependence among parties in a classical contract is very weak or non-existent. This can be explained by the low degree of asset specificity (Ménard, 2000: 239). In these contracts, formal clauses specify most characteristics at stake, the identity of the parties to the contract is irrelevant, and the transactions highly monetized (Ménard, 1996: 157). The short term orientation makes it appropriate to regard the contract as fully expressing all the future rights and obligations of the parties, while the absence or relation-specific investments means that opportunism can be effectively countered by the threat of exit from the relationship or by resort to courts. This means that these contracts are mainly self-enforcing. Law courts adjudicate in the event of a disagreement (Lyons & Mehta, 1997: 49); the safeguards can be characterised as public ordering. The role of public ordering is limited to reaching an agreement and/or ordering the recalcitrant party to comply or to pay damages (Ménard, 2000: 246). With court enforcement the low likelihood of repeated contracts makes the loss of significant future goodwill unimportant (cf. Deakin & Michie, 1997: 11). Long-term commitment plays no role in classical contracts.

A neo-classical contract is typically a long-run arrangement in order to develop a continuing relationship. Normally the contract specifies a fixed duration or task to be completed (Lyons & Mehta, 1997: 49). The identity of the parties does matter in this relationship, since bilateral dependency is non-trivial, while adaptation mechanisms must be elastic enough to enable parties to adjust to moderately consequential disturbances. A neo-classical contract defines adaptation mechanisms for improving - relative to pure market relationships - the capacity to adjust to unanticipated disturbances (Ménard, 1996: 157-158). The parties accept at the outset of the agreement that the contract is incomplete, in the sense of being unable to specify their rights and obligations in all future states of the world. Because of the incompleteness of this type of contract, disputes are more frequent and more complex to solve, and less likely to be resolved by formal enforcement procedures in the contract (Ménard, 2000: 239). The written documentation provides the status quo from which to renegotiate. Courts are used to solve problems. The parties attempt to use their agreement to plan for future contingencies by using mechanisms of 'trilateral governance', including hardship and arbitration clauses (cf. Deakin and Michie, 1997: 12). Public ordering is also important for neo-classical contracts. Public ordering goes beyond defining the rules of the game for the domain of private ordering. It also

complements a series of mechanisms explicitly designed to enforce contracts and to support transactions. As a result, it continuously interferes with private ordering (Ménard, 2000: 246).

Relational contracts are characterised by the substitution of the legal and its accompanying formal documents by informal agreements such as verbal promises, letters of intent, or gentleman's agreements (cf. Lyons & Mehta, 1997: 51). In relational contracting prices play a small role as adjustments; instead norms of behaviour or shared codes of conduct prompt responses to new developments as they unfold. These norms or shared codes of conduct overrule written documents in settling outputs. The duration is normally indeterminate (c.f. Lyons and Mehta, 1997: 49). In these contractual arrangements, adaptability to highly consequential disturbances is crucial, while highly specific assets create risks of opportunism that detailed safeguards are built in to reduce. Private ordering prevails, while public rules delineate the acceptable domain in which arbitrariness can operate (cf. Ménard, 2000: 248). Hierarchy is at the core of adaptability and operates through "fiat," acting as "its own court of ultimate appeal" (Ménard, 1996: 157; Williamson,1996: 98; Ménard, 2000: 247). This makes safeguards within the contract not important because one of the parties has the power to take decisions. The identities and personal attributes of parties are crucial in these types of contracts (cf. Lyons & Mehta, 1997: 49).

2.6 Summary and conclusions

Standard microeconomic theory focuses on the market as exclusive mechanism for co-ordinating economic activities. However, when the economic environment significantly departs from the artificial Neoclassical pattern the market will fail to produce Pareto-optimal outcomes. An alternative to a market is a non-market government intervention. However, also government intervention often fails. Both kinds of failures are examples of institutional arrangement failures. New Institutional Economics is concerned with the question of which institutional arrangement is economically efficient under what circumstances.

The basic elements of the framework for analysing institutional arrangements are the institutional environment and institutional arrangements. The institutional environment is the set of fundamental political, social, and legal ground rules that establish a basis for production, exchange and distribution and are concerned with composite levels of activities. The institutional environment depends on place and changes in time, and is on an aggregate level.

In a society there exist all kinds of arrangements between individuals, individuals and groups, or between groups. An institutional arrangement is designed to provide at least a structure in which its members can co-operate. Institutional arrangements can be formal and/or informal. Two of them can be distinguished as extreme poles: markets, and hierarchical organisations. The areas of overlap between markets and hierarchical organisations give rise to hybrids. Hybrids are co-ordinated and conducted by active forms of governance which emanates from the partners, and operate through authority. In order for authority to be efficient, it requires mutual consent and commitment.

From the institutional economics analysis in this chapter it follows that these characteristics are relevant to analysis of institutional arrangements:

1. the transaction;
2. the influence of the institutional environment with respect to time, place and level;
3. the instruments of an arrangement: incentive intensity, administrative controls and authority;
4. performance attributes: autonomy and co-operation adaptation;
5. the role of contract law;
6. the clarity of residual control rights;

7. type of contractual arrangement.

Differences among contracts correspond to the characteristics of the institutional arrangements in which they are embedded. Along with the differences in institutional arrangements, contracts differ in the following key elements:

1. relevance of the identity of parties;
2. contract duration: discrete exchange or indeterminate duration;
3. degree of completeness;
4. enforcement procedures.

The characteristics of institutional arrangements and the key-elements contracts show that order can be brought into the array of available institutional arrangements and contracts, the design of which shall be analysed in following chapters.

Chapter 3

Institutional arrangements for wildlife and landscape management

3.1 Introduction

The institutional environment and institutional arrangements are linked in a framework for analysing transactions in wildlife and landscape management as presented in Section 3.2. Transactions, and the involved transaction costs - given the institutional environment - determine the selection of an appropriate institutional arrangement. This gives rise to the first question in this chapter: How can the transactions of farmers concerning managing wildlife and landscape be characterised? Section 3.3 examines this question. The second question in this chapter is: what is a suitable institutional arrangement given the characteristics of this transaction. Section 3.4 looks at the selection of institutional arrangements from the point of view of transaction costs economics. The chapter finishes with a summary and conclusions in Section 3.5.

3.2 Framework for analysing institutional arrangements

The institutional environment and institutional arrangements constitute the basic theoretical elements of the framework applied in this thesis for analysing institutions. The framework is presented in Figure 3.1. The way in which the institutional environment and arrangements are linked is based on the work of Williamson (e.g. 1996: 223; 1998: 26; 2000a: 597). The solid arrows, which connect resource allocation and employment with the institutional arrangements and the institutional arrangements with the institutional environment, signify that the higher level imposes constraints on the level immediately below. The circular arrows within the institutional arrangements show that institutional arrangements - like environmental co-operative and

contractual arrangements - have a life of their own, which can be spontaneous or intentionally designed. The dashed reverse arrows connecting, respectively, the institutional environment with the institutional arrangements, the institutional arrangements with resource allocation and employment, and finally resource allocation and employment with individuals and groups, signal a feedback. For instance, individuals can influence the institutional environment through the electoral process (cf. Williamson, 1994: 323). The level of resource allocation and employment is the level on which neo-classical analysis works. Optimality apparatus - often marginal analysis - is employed, and for these purposes, is typically described as a production function (cf. Williamson, 2000a: 600). Optimisation takes place given the existing institutions. The level of individuals and groups is added to show that people in a society influence and are influenced by the institutions in a society. The individuals and groups are boundedly rational and behave opportunistically.

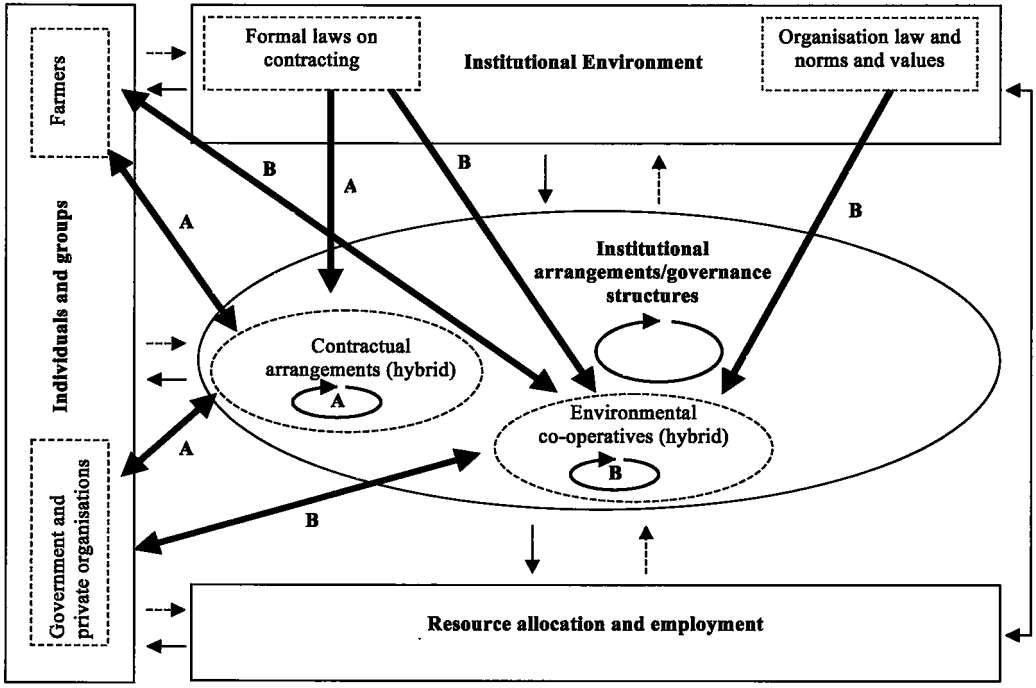

Figure 3.1: Conceptual framework for analysing institutional arrangements

Two arrangements for combining agriculture and the management of wildlife and landscape are analysed in this chapter in more detail: contractual arrangements and environmental co-operatives for wildlife and landscape management. Both arrangements have in common that they are meant to combine agriculture with the management of wildlife and landscape. The main difference between environmental co-operatives and contractual arrangements is the number of agents involved. The contractual arrangements are bilateral arrangements between individual farmers and the government or a private contractor. The relevant relationships for contracting arrangements are given by the fat arrows labelled "A" in Figure 3.1. These relations can be divided into two groups. First, the relation between the parties to the contractual arrangement: farmers and contract givers. Second, the influence of the institutional environment on both parties, such as the public enforcement mechanisms that are available in all contracting arrangements.

An environmental co-operative concludes contracts collectively with the government or private contractors. The relationships for environmental co-operatives are labelled with a "B" in Figure 3.1. The parties to the environmental co-operative arrangement are farmers and contractors. The relationships of farmers to an environmental co-operative are more complicated than the relationships of farmers to contractual arrangements. On the one hand the farmers are contracted by the environmental co-operative to provide management services and on the other hand they are members or participants of the co-operative. The contract givers conclude contracts with the co-operative for managing wildlife and landscape on the level the environmental co-operative. The co-operative is also influenced by the institutional environment, e.g. by the laws regarding the possibilities of legal entities. Having distinguished the relations involved in managing wildlife and landscape, the next step is to analyse the transaction of wildlife and landscape management in more detail.

3.3 The attributes of wildlife and landscape management

Two important criteria characterising the attributes of wildlife and landscape are non-excludability and non-rivalry.Non-excludability is the property of a good such that the benefits of that good not only can be, but also in fact are, made available to all. Exclusion may not be

feasible for technological reasons, as in the case of national defence, or for an institutional reason, as in the case where property rights can not be assigned. When exclusion is impossible, the free rider problem and the associated prisoner's dilemma arise (Boadway and Bruce, 1989: 129 - 130). Field research confirms that the temptation to free-ride on the provision of collective benefits is a universal problem (Ostrom 2000: 138). Non-rivalry in consumption means indivisibility of the benefits. A good is non-rival or indivisible when a unit of the good can be consumed by one individual without detracting in the slightest on the opportunities for consumption of the same unit still available to others (cf. Cornes and Sandler 1996: 8).

Based on the characteristics of rivalry and excludability of goods, a spectrum of goods can be distinguished. Pure public goods have the properties of non-rivalry and non-excludability. Pure private goods are fully rival and excludable. Impure public goods, whose benefits are partially rival and/or partially excludable, occupy the intermediate points along this spectrum. An important subclass of such goods comprises those whose benefits are excludable but partially non-rival; these goods are club goods (Cornes and Sandler 1996: 9). The essential difference between club goods and pure public goods depends on the existence of an exclusion mechanism.

Based on the criteria of rivalry and excludability, the benefits of wildlife and landscape are impure public goods. Technically it is possible to exclude people from the benefits, e.g., by fencing them out. Geographical exclusion is also possible. Technical exclusion can involve considerable costs however.

Land, as an asset with valuable wildlife and landscapes, has many attributes. Some attributes are excludable like the use of land for agricultural purposes, and some are non-excludable like wildlife and landscape scenery. Further, some attributes are rival in consumption, like the using of land for agricultural production, while others are non-rival like wildlife and landscape. The question is: who has the property rights over these attributes? For the use of agricultural land for agricultural production this seems clear: the landowner has the property rights. However, establishing effective control over wildlife is difficult and the property rights are unclear. If attributes of land are valued differently from each other, ownership conflicts can arise. Farmers could say: "It is my land, and therefore I have the property rights and I can decide how to use my land". But because of the properties of non-rivalry and (to some extent) non-excludability, wildlife and landscape are not pure private goods. Ownership of many attributes is often divided between two or more persons rather than being assigned to a single person.

The costs of determining, 'capturing', and retaining the attributes of an asset are defined as transaction costs. The presence of transaction costs means that asset attributes can not be fully known to (prospective) owners. The result is that the rights to assets – or more specifically, to the asset attributes – are not fully delineated (cf. Barzel, 1997: 4). Property rights assigned to valued attributes of a species can be viewed as a subset of the attributes inherent in a tract of land. In general, the size of a landholding will be closely correlated to the attribute that most influences the value of land (Lueck, 1989: 300). Therefore ownership of farmland is related to the agricultural production. This implies that the ownership pattern of land – which itself has a variety of valuable uses – often does not coincide with the actual territories of valuable wildlife stocks (cf. Lueck, 1989: 300). A similar way of reasoning applies to landscape.

The consequences of goods and services possessing many attributes and also the relatively high transaction costs involved in determining these attributes are twofold. First, divided property rights emerge, with two or more individuals having rights to distinct attributes of the same asset. Second, the incomplete separation of property rights means that some attributes can not be specified or allocated to the property right holders. As a result of these two effects, some of the attributes remain part of the 'public domain', or form what Barzel (1997: 5) calls common property. According to Barzel (cf. 1997: 5) a commodity lies in the 'public domain' when the resources needed to acquire it accrue to no one. Once attributes are in the public domain, individuals can spend resources to 'capture' it. This is characterised as 'capture' because here, in contrast to a market sale, the original owner does not receive what the recipient spends. For example the travel cost and waiting time that people spend in line to acquire a 'free' good accrue to no one, therefore such a good lies in the public domain (Barzel, 1997: 5).

People tend to delineate their property rights more carefully as the value of these rights increases and less so as their value declines. Imperfect delineation of property rights is sometimes a result of the choice of the owners not to exercise all of their rights. Owners find or deem some of their rights too expensive to exercise and choose to place them in the public domain (Barzel, 1997: 93). In the past farmers have left (or placed) the gain from the attribute wildlife and landscape in the public domain. They did not claim the property rights.

For reasons of non-excludability and non-rivalry and transactions costs, the characteristics of '*wildlife* and *landscape*' are distinguished from the activities and services of providing or managing these attributes. A service can be defined as a relation between a service-performer and

a service-receiver that delivers the desired attributes (Ruys, 2000: 2). In the case of an individual farmer, this farmer is both performer and provider of a service. In the case of an intermediary organisation the farmer is a service performer and the intermediary organisation is a service-provider. Consumers of wildlife and landscape are service-receivers, however they do not contract these services themselves. Service contractors are the government and private organisations in the sense that they conclude contracts with farmers. The main difference between wildlife and landscape and the services provided by farmers or organisations is the possibility of excluding persons from making use of or benefiting from the attributes. On the basis of the criteria of specification (type of the property rights), the establishment and enforcement of property rights, wildlife and landscape are in practice partially non-excludable attributes. Regarding the property of rivalry, wildlife and landscape are also non-rival attributes. On the other hand, the activities and services of individual farmers and intermediary organisations are excludable (and on a certain level rival) goods. These services can be contracted.

Wildlife and landscape is often managed in combination with the production of private goods such as food, raw materials and ornamental plants. If, on one hand, the type of wildlife and landscape management is technologically tied to agricultural land use (joint inputs), potential non-agricultural providers have to adopt a similar mode of land-use. This means that this type of wildlife and landscape management is not separable in terms of land-use and that no separate production functions can be written to both outputs (cf. Chambers, 1988: 288). If, on the other hand, wildlife and landscape management and the production of private goods are not joint in terms of input quantities, each output is produced by a separate production function, with the supply of production factors allocated to the different outputs. This means that the attributes of land can be produced or managed by different parties.

In addition to the problem of delineating property rights, there can be problems of writing a contract due to measurement problems – even when the ownership of attributes is clear. Measurement means quantifying the attributes of a transaction. In fact, what is exchanged among parties to a transaction is a bundle of rights that measure various attributes of the goods and services exchanged or of the performance of agents (cf. North 1986: 232). Problems and costs of measurement pervade significantly and affect all economic transactions (cf. Barzel, 1982: 354). Some dimensions have a natural measure such as the financial compensation or duration. Other

dimensions are not continuously measurable, but are discrete choice variables, such as the decision to use a standard provision or a penalty clause. Dimensions like the quality of wildlife and landscape are even more difficult to measure.

None of the central hypotheses of contract theory is immune to chronic measurement problems (Lyons, 1996: 30). Transaction cost hypotheses require data on organisation form as well as such detailed information about the character of transactions as: the level of uncertainty associated with exchange, the complexity of products and processes, and the extent to which assets needed for products are specific to the particular relation (Masten, 1996: 47). Also the contracting parties themselves are confronted with these measurement problems, although they might perceive these in a different way. Measurement problems are one of the causes of incomplete contracting because the contracting parties are not able to write a clear and enforceable contract. These incomplete contracts may lead to opportunistic behaviour concerning execution of the contract or investments. For instance, in the case of incomplete contracts for wildlife and landscape, the quality the government (or others) want cannot be fully specified.

The cost of measuring wildlife and landscape means that the rights to wildlife and landscape are perfectly delineated, and it is unlikely that a landowner controls all of them or control any of them perfectly. Therefore the attributes of wildlife and landscape are not fully known to prospective owners and are often not known to the current farmer either (cf. Barzel, 1997: 4). If measurement is not possible or too costly, a free-rider problem exists and monitoring is effective. For instance, farmers benefit from receiving financial compensation for concluding contracts with the government for preserving meadow birds. However it could be that difficulties in measuring effort of farmers to preserve meadow birds result in little incentives to put effort into management. The contract is in that case reduced to a form of income support to farmers. But even when the attributes of goods or services are known, the greater the variability of measurement surrounding the true value, the less the information about the commodity. In practice, various methods are applied to lower measurement costs like product warranties and share contracts (Furubotn and Richter, 1997: 293).

3.4 Contractual arrangements and contracts for wildlife and landscape management

Following transaction cost economics, three key dimensions are involved in a transaction: asset specificity, uncertainty and frequency (cf. Williamson, 1985: 52; Williamson, 1996: 45; cf. Ménard, 1996: 173; cf. Williamson, 1998: 36). Within transaction cost economics it is assumed that transaction costs are linked directly to these dimensions (cf. Saussier, 2000a: 381). Asset specificity refers to the degree to which an asset can be redeployed to alternative uses, and by alternative users, without sacrifice of productive value (cf. Williamson, 1996: 105). The basic logic is that higher levels of uncertainty and higher degrees of asset specificity, particularly when they occur in combination, result in a more complex contracting environment and a greater need for adjustments after the relationship has begun and commitments have been made (Hölmstrom and Roberts, 1998: 76). A hierarchical relationship is presumed to make resolving potential disputes easier than does a market relationship. The frequency of a transaction matters because the more often a transaction takes place, the more widely are spread (over different transactions) the fixed transaction costs of establishing a non-market governance system.

Williamson (1983: 526) distinguishes several types of asset specificity. However Joskow (1987: 170), following a suggestion of Tirole, believes that the identified types of asset specificity are simply different instances of the same phenomenon. These different types of asset specificity give insight into the dimensions of asset specificity. In his later work Williamson distinguishes six different types of asset specificity: (1) site specificity; (2) physical asset specificity; (3) human asset specificity; (4) dedicated assets; (5) brand name capital and (6) temporal specificity (Williamson, 1996: 59-60). The following types of asset specificity are relevant in transactions for wildlife and landscape management:

1. *Site specificity*

   Site specificity refers to an asset that becomes committed to a particular use owing to its location. Investments are valuable on a specific location and cannot be moved to another location. Once the investment is sited the assets in question are highly immobile (cf. Joskow, 1987: 170). Valuable areas for wildlife and landscape are immobile and local (i.e. tied to a particular area). Investments that increase the value of wildlife and landscape are site specific investments.

2. *Physical asset specificity*

   Specific physical investments are investments that have a narrowly defined purpose. Investments in equipment or in machinery used for wildlife and landscape management can be narrowly defined and are sunk investments. An example is the special equipment used to protect the nests of meadow birds.

3. *Human asset specificity*

   Human asset specificity arises in a learning-by-doing process (cf. Williamson, 1996: 105). Attending courses for wildlife and landscape management and gaining experience in wildlife and landscape management are examples of human specific investments.

4. *Dedicated assets*

   Dedicated assets are investments in the general production capacity for a special customer; these investments have no special purpose. Dedicated assets are those that are put in place contingent upon particular supply agreements and, should such contracts be prematurely terminated, would result in significant excess capacity (cf. Williamson, 1996: 129). An example of dedicated assets is investment in extra farmland that is needed for wildlife and landscape management.

Contingent on the set of transactions to be effected, the basic proposition following from transaction costs economics is that institutional arrangements differ in their capacities to respond effectively to uncertainties (cf. Williamson, 1985: 56). In the case of non-specific investments, uncertainty has little effect. There is potential maladaptation in reaction to disturbances. Greater uncertainty could take either of two forms (Williamson, 1996: 116). One is that the probability distribution of disturbances remains unchanged but that more numerous disturbances occur. The other is that disturbances become more consequential (due, for example, to an increase in the variance). Uncertainty of a strategic kind is attributable to opportunism and Williamson (1985: 58) refers to this kind of uncertainty as behavioural uncertainty. Examples of uncertainties with respect to wildlife and landscape management are weather conditions.

The third dimension, frequency, involves the repetition of the same transaction. The frequency of a transaction can be recurrent, occasional or once time (cf. Williamson, 1985: 72).

The frequency of repeated dealing is important, both because it is repetition which generates transaction specific knowledge and because infrequent dealing would not warrant the development of an expensive institutional arrangements (cf. Ricketts, 2002: 49). The costs of specialised institutional arrangements are easier to recover for large transactions of a recurring kind (cf. Williamson, 1985: 60). Recurrent transactions make possible a reputation mechanism in case of specific investments. Reputation serves as a safeguard against *ex post* opportunism. With respect to determining the frequency of service delivery it is important to know when a service transaction is completed. A wildlife and landscape management transaction is assumed to be completed if the objectives of the transaction are met or the management prescriptions within the contract are fulfilled. The objectives or management prescriptions depend on natural seasons and are for every year of the contracting period the same.

Several types of transactions for wildlife and landscape management by farmers can be distinguished. These transactions differ in the following dimensions: asset specificity, frequency, and uncertainty. With help of these dimensions the following transaction types for wildlife and landscape management are defined:

1. *Wildlife and landscape preservation transactions*

   Farmers preserve natural "handicaps" by refraining from activities that change the attributes of the land. Examples of attributes that are preserved are soil structure, form of parcels, and ground or ditch water level. However, location specificity is important although this does not require (new) investments, attributes that are preserved should be available. The loss in investment opportunities to transform the attributes of land means a transaction specific investment. There may be a cost or benefit to delaying investments (Dixit and Pindyck, 1994: 8). Uncertainty for the farmer is low because the task to perform is clear. The frequency of the transaction is recurrent and once a year.

2. *Wildlife and landscape development transactions*

Wildlife and landscape development means above all that the existing attributes of land are preserved. This is similar to the transaction type "wildlife and landscape preservation" (transaction 1), but beyond that management is carried out that is thought to develop meadow bird populations and plant species. The most important characteristic of development transactions is that farmers must eschew certain land use practices, and land use is restricted. These transactions are quite diverse in terms of wildlife and landscape management prescriptions: certain management activities are modified (e.g. cutting grass or livestock grazing are postponed), others eliminated (e.g. fertilising, scarifying).

Relevant existing examples of management transactions are transaction-types that center on the delay of the first cut of grass until a predetermined date. These transactions give meadow birds the opportunity to settle, lay and sit eggs, to sit on the eggs, and to raise their young. The loss of eggs or young due to grass-cutting or trampling by cows will be restricted or prevented by these contracts. These reproduction-period contracts are combined with restrictions on agricultural activities in spring (no ploughing, use of rotary cultivator, or sowing; almost no use of pesticides) and can be extended with optional restrictions or provisions, as in the allowance for use of a certain amount of straw manure.

Reproduction-period transactions have a large impact on farm management in total and not only on the farmland under contract (Haan et al., 1995: 67 and Vellinga and Verburg, 1999: 1). The first-cut grass from land under a management agreement has a low energy and protein content in comparison to the other roughage on the farm. This grass (hay) is fed to dry cows, heifers and calves (in this sequence, Haan et al. 1995: 8). In general, there is no market for hay from land with a delayed first cut (Haan et al., 1995: 62). The possible area of grassland with management agreements on a dairy farm is in practice limited. Haan et al. (1996: 23) calculate that at certain levels of milk quotum per hectare, the amount of management agreements that can fit in varies between 0 and 50% off the total area of grassland.

When a transaction is carried out, the dry matter content of the first cut does not change. However, it does have an effect on the size of the first cut. The longer the reproduction period of birds, the lower the grass amount of the other cuts. Due to this transaction extra hay from this land becomes available for the farm. The longer the reproduction period, the more hay comes available. Because of the changing roughage production on the farm it will be necessary to buy roughage and feed concentrate. The longer the reproduction period the more roughage and concentrate feed have to be bought.

Wildlife and landscape development transactions lead to changes in type of land-use that change the quality of farmland and therefore mean site-specific investments. These investments cannot be moved to another location. Human asset specificity is relevant because knowledge is needed to manage wildlife and landscape. There degree of uncertainty for the farmer is low because this kind of transaction is clear and easy to monitor. The frequency of the transaction is recurrent and often once a year.

3. *Maintenance of wildlife and landscape transactions*

Under maintenance transactions, farmers are obliged to maintain, specifically, one or more 'wildlife and landscape elements', such as hawthorn hedges, windbreaks, pollard trees, or ponds. Site specificity is important because the investments are located in a certain area, although alternatives are available. Further, physical specificity is relevant because special equipment for maintenance is needed. Human specificity is also relevant because maintenance requires special skills. Uncertainty is moderate, given the influence of natural conditions on the task to perform. Frequency of the transaction is recurrent and once or a few times a year.

4. *Products delivered*

The reward for 'nature production' depends on the results, i.e. on the 'products delivered': for example, a payment per clutch of eggs of a certain rare meadow bird species, or a payment proportional to the number of rare plant species found in a field. The farmer is partly or completely free in the choice of wildlife and landscape management. Hence, he can choose a type of management that fits his circumstances best. This means that payments for products delivered is more than

a change of incentives compared to management contracts. Site specificity is important because investments are needed to create better circumstances for species, with the expectation of a larger variety of species or more animals per species. Physical asset specificity is relevant because special equipment is used for this kind of transaction, like equipment to protect birds from grazing cows. Human asset specificity, compared to the other transactions, is much more important because knowledge about species and their behaviour is required. The frequency of a transaction is recurrent and often a few times a year. Uncertainty in these transactions is relatively higher compared to the management and maintenance transactions because the results partly depend more on ecological factors, over which control is incomplete.

Combinations of these transactions within one transaction are possible. This means a complex combination of management transactions, maintenance transactions and transactions based on product delivered, within one transaction. It is not presumed that the list of transactions is complete; however relevant categories of possible transactions are given. Table 3.1 summarises the transactions with respect to the characteristics of the transaction.

Table 3.1: The characteristics of wildlife and landscape management transactions

Transaction	Characteristics of transaction		
	Asset specificity	Uncertainty	Frequency
Preservation	present, but low	low	Recurrent, once a year
Development	moderate	low	Recurrent, once a year
Maintenance	high	low	Recurrent, few times a year
Products delivered	high	high	Recurrent, few times a year

The selection of an appropriate institutional arrangement from a transaction costs economics point of view is based on asset specificity, uncertainty and frequency of the transaction. Characteristics of wildlife and landscape management transactions are given in Table 3.1. Preservation transactions or simple maintenance transactions could be governed by market arrangements because of their low degree of asset specificity. However, location specificity

relevant for both parties is present. Therefore, hybrid contracts governing these transactions are expected with a neo-classical contract.

For management transactions like 'grassland bird management' the degree of asset specificity (site, physical and human) is much higher compared to preservation transactions. Frequency and uncertainty are relatively low. Hybrid institutional arrangements can be expected. For transactions based on products delivered the degree of asset specificity, based on site, physical and human specificity is higher. Uncertainty for these contracts is much higher compared to the management transactions. Also here hybrid institutional arrangements can be expected. Institutional arrangements in the form of hybrid arrangements go hand in hand with contracts that are both significantly incomplete (to facilitate efficient co-ordination of interdependent assets in an uncertain environment) and highly complex (because of the autonomy of the property rights among partners).

Many environmental co-operatives have an agreement with the government to achieve certain targets, and agreements with individual farmers to carry out tasks. The type of institutional arrangement varies among and within the co-operatives. Some institutional arrangements focus on individual plots of land or individual farms, while other institutional arrangements focus more on common property resources like landscape and watershed management. These contracts can be characterised as combinations of the transactions in Table 3.1. Therefore it is expected that these contracts be governed by hybrid institutional arrangements.

In the preceding chapter (Table 2.2) four key elements for contracts are derived: (1) Relevance of the identity of parties; (2) Contract duration: discrete exchange or indeterminate duration; (3) Degree of completeness; and (4) Enforcement procedures. These key elements are discussed with the objective of being able to characterising the contract type for wildlife and landscape management contracts. The identity of the parties is relevant to wildlife and landscape management contracts. In the first place, a contract is often tied to a specific location that is owned or leased by a farmer. Second, the person of the farmer is important for those types of contracts that build on learning by doing. Also the willingness of farmers to conclude contracts makes the identity of the farmer relevant. The duration of the contract is in general moderate. A contract of 5 or 6 years is common. The contracts are incomplete. Not all possible contingencies are in the contract. The written documentation is important because it gives the basis of the

transaction. Norms and values are less important in relations with the government than in contracts between individual farmers and environmental co-operatives. Finally, enforcement procedures are formal. The regulation contains special procedures for situations in which the parties to the contract do not fulfil the terms of the contract. Additionally, a special committee is set up to deal with conflicts.

Figure 3.1 illustrated the diversity and complexity of the relationships for managing wildlife and landscape. Looking at the characteristics of the contract, most contracts for wildlife and landscape management are neo-classical contracts.

3.5 Summary and conclusions

This chapter is concerned with identifying an appropriate institutional arrangement for wildlife and landscape management transactions between contractors like government, large wildlife and landscape management organisations and individual farmers. The framework (Figure 3.1) in this chapter illustrates the complexity of the relations between environmental co-operatives, governmental agencies, and individual farmers. These institutional arrangements are determined by the individuals and groups, the institutional environment, and by resource allocation and employment. In their turn these institutional arrangements influence individuals and groups, the institutional environment, and resource allocation and employment. Measurement problems pose a problem to wildlife and landscape management contracting. The cost of measuring wildlife and landscape management means that incomplete contracts will be signed and that the wants of contractors like the government cannot be fully specified.

From New Institutional Economics and the attributes of wildlife and landscape management it follows that hybrid arrangements for combining agriculture and wildlife and landscape management, can be expected. The market, with prices as the only co-ordination mechanism, will fail due to the attributes of wildlife and landscape management. Due to the relation between institutional arrangements and contracts it follows that the contract is a neo-classical contract. This means that the asset specificity is high enough to create mutual dependency among the contracting partners. Contracts will be incomplete and adjustments to contracts are important, as is the duration of the contracts. Other means of co-ordination are

necessary besides prices and hierarchy. Because of incompleteness, disputes will be frequent and are less likely to be solved by formal procedures.

With hybrid arrangements there are many possible mechanisms that all belong to the family of hybrid arrangements. This makes it necessary to extend the analysis of contractual arrangements for managing wildlife and landscape and to fill in the gaps in the design of hybrid arrangements and neo-classical contracts. The remaining part of this thesis focuses on different aspects of contract design.

Chapter 4

Methodology

4.1 Introduction

The traditional methodology of mainstream economics consists of rules for good scientific research with a view to theory appraisal. These rules act as means of demarcating science from non-science, as well as providing economists with the criteria by which to recognise the best theory. Further, these rules require that theories be tested against the facts; the traditional methodology literature consists of debate about the nature and role of the rules for testing (Dow, 1997: 75). However, "No one methodology can elicit all the complexity, heterogeneity, and kaleidoscope of the economy. (...) Individual economists have the opportunity, even the authority, to pursue economics as they see it" (Medema and Samuels, 1996: 3). The search for independent standards for economic theorising continues, even though some researches accept the possibility that there may not be just one set of standards for all economics (cf. Dow, 1997: 78). The current literature on theory appraisal in economics and economic methodology in general is quite eclectic. This means that one focuses on the methodology economists practice, making use of whatever tools philosophers of science have had to offer that appear to be well-made and apt for the job (Hausman, 1989: 125). This is comparable to the view of Varian, that the methodological promise of dentistry and economics is similar - we value what is useful (cf. 1996: 238). Dow observes that most of the work in methodology over the last ten years has consisted of methodological analysis of what economists do and how they argue. The current state of mainstream economic methodology in general reflects a polarisation of positions on the role of methodology: it either prescribes what good science should be, or it describes the methodology implicit in economic theorising (cf. Dow, 1997: 78-80).

Paying attention to methodological issues is relevant for this thesis because several theories and methods are combined within one research project. In this thesis, methodology is not used in the sense of prescribing good science because this seems not (yet) possible, however, the methodology applied is described on the basis of the research process of the project.

Section 4.2 starts with an overview of the research process of the whole project. Within the research process the main theoretical orientation was an important guide. The sources of primary data were two mail surveys: (1) a survey among individual farmers on contractual arrangements for wildlife and landscape management; and (2) a survey among environmental co-operatives in the Netherlands. Section 4.3 discusses the evaluation of mail surveys in general terms. The first reason for addressing both surveys in this chapter is to discuss their evaluation in a coherent way. A second reason is that the evaluation in this chapter makes it unnecessary to discuss the same issues concerning the surveys every time the results are used. The contractual arrangement survey is discussed in Section 4.4 in more detail. Section 4.5 evaluates the survey among environmental co-operatives. This chapter ends with conclusions and a summary in Section 4.6

4.2 Research process

As addressed in the introduction to this chapter, the analysis of wildlife and landscape management in the agricultural sector was split into two main empirical areas:

1. Contractual arrangements for wildlife and landscape management between individual farmers and the government or large private wildlife and landscape preservation organisations (private contractors);
2. The role of environmental co-operatives in managing wildlife and landscape in agricultural areas.

Contractual arrangements between individual farmers and the government or private contractors were analysed to get insight in the decision to contract and the design of contracts. Research on environmental co-operatives was conducted to gain insight into the way groups of farmers organise and govern themselves for managing wildlife and landscape collectively. The research

process of the project - developed for analysing both empirical objects - is described in Figure 4.1.

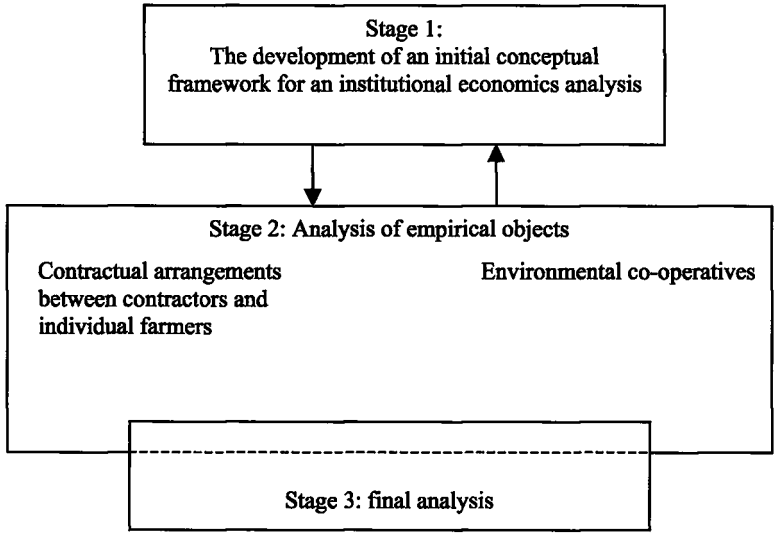

Figure 4.1: Outline of research process

The research project started with the development of an initial conceptual framework for analysing institutional arrangements. During the research project the initial framework was adapted, extended and revised. The main theoretical orientation for the conceptual framework and the thesis is New Institutional Economics. The choice for New Institutional Economics is justified because the topic of research is to analyse of different institutional arrangements for wildlife and landscape management. Consistent with New Institutional Economics this study focused on transactions and the way these transactions are governed within institutional arrangements. Neo-classical production theory is a minor building block in of this thesis. Within the neo-classical framework several standard assumptions are made that conflict with New Institutional Economics, such as the rationality of choice makers or the underlying determinism. However, the approach can be justified by its focus on the way the technology influences the decision to transact within given institutional arrangements. In fact the basic determinant of the

form of exchange is the choice of structure which reduces most combined transaction *and* production costs (cf. North, 1986: 231 and cf. Saussier, 2000a: 381; cf. Williamson, 1985: 61).

The objective of the second stage of the research process (Figure 2.1) was to elaborate further the initial framework and to apply and extend the framework to these two empirical objects:

1. Contractual arrangements;
2. Environmental co-operatives.

The research process in the second stage consisted of four steps for both empirical objects:

1. Adaptation and refinement of initial conceptual model
2. Refinement of research methods;
3. Data collection and processing;
4. Analysis of results and conclusions.

The main method applied in this thesis is a "literary approach" (see e.g. De Alessi, 1990:11-13 and Furubotn and Richter, 1990: 1) combined with statistical methods using data from mail surveys. A literary approach is based on theory and makes use of close reasoning. Scholars using the literary or verbal approach tend to incorporate substantial descriptive detail into their analyses of organisational or institutional problems (Furubotn and Richter, 1990: 1). A less formal approach is consistent with a large part of the research tradition in New Institutional Economics (e.g. Whinston, 2001: 184; Williamson, 2000b: 49; Ménard, 2001: 87). Much of New Institutional Economics uses close reasoning; but much of it has also so far resisted 'full formalisation' (Williamson, 2000b: 49). When it comes to the analysis of the global rules underlying the organisation of transactions, there are almost no mathematical models, although rigorous frameworks of analysis exist on which predictions can be based and measurements developed (Ménard, 2001: 87). This is both a benefit and a cost (Williamson, 2000b: 49).

The benefit of a literary approach is that New Institutional Economics has never lost contact with real phenomena. The costs are of two kinds: New Institutional Economics is more difficult to teach; and logical lapses and/or extensions go undetected in the application of less formal analysis (cf. Williamson, 2000b: 49). However, a literary presentation that is worked out carefully and precisely, or that relies on a suitably formal derivation already found in the

literature can be as rigorous as the circumstances demand (cf. de Alessi, 1990: 12). A more formal presentation does not mean that the analysis is necessarily more rigorous. The relative usefulness of the literary and the formal approaches depend, in part, on the problem at hand and the audience (cf. de Alessi, 1990: 13 and Furubotn and Richter, 1990: 3). Moreover, Furubotn and Richter (1990: 3) state that there is reason to believe that different methodological approaches can be mutually supportive. This thesis attempts to incorporate the results of approaches using more formal reasoning.

For the analysis of contractual arrangements a literary approach combined with data from a mail survey was useful for several reasons. The first reason was that at the moment the research process started, little was known about these contractual arrangements from a transaction point of view. Mainly, the number of farmers involved, the area and location under contract were known. The main determinants of transaction had to be investigated; these are often however difficult to measure. A second reason was that the available formal models are often very abstract and depend on many strict assumptions.

Adapting the conceptual framework to the arrangement of environmental co-operatives lead to a literary approach combined with a mail survey mainly for three reasons. The first reason was related to measurement problems of the attributes of environmental co-operatives, which have may attributes making their governance structure complicated to model mathematically in full detail. The second reason was that there were no primary data sources available that could provide insight into the diversity of environmental co-operatives on a large scale. Most sources available were studies based on a small number of cases and there were almost no studies focussing on similarities and/or differences between environmental co-operatives. A third reason was that specific kind of data requirements for a New Institutional Economics approach made it difficult to use existing sources. Existing sources often neglect institutional aspects of governance structures.

A second method was a Tobit model concerning the decision to contract by individual farmers. The third method of research for analysing contractual arrangements was a formal model consisting of supply and demand equations for inputs and outputs based on a neo-classical production theory and especially its dual form (e.g. profit function) framework. The application of static duality theory under price certainty is well developed in the literature (e.g. Boots, 1999, Chambers, 1988: 281; Oude Lansink, 1997, and Thijssen, 1992). The purpose of the modelling

work was to determine the consequences of the possibility of concluding contracts for wildlife and landscape management. The availability of a panel data source, provided by LEI, allowed us to identify dairy farmers' behaviour at the micro level and to check theoretical assumptions. Econometric techniques to analyse panel data were used. Further, a simulation model was used to simulate the co-operation of farmers in contracting for wildlife and landscape management. The simulations were used to analyse the potential effects on profit and the use of inputs resulting from wildlife and landscape management.

The final stage of the research project was an analysis integrating the theoretically structured insights regarding the research questions raised in the subsequent chapters. The major conclusions of the total research project were drawn in this phase of the project.

4.3 Surveys as a tool for analysing institutional arrangements

One of the main tools used in this thesis is the mail survey. In general, questionnaire surveys gather 'facts' like prices, quantities of goods bought, incomes, revenues and so forth. Surveys are often conducted by a national statistics agency or may be specially designed by an investigator to address a particular question[1]. One of the main uses of surveys is 'Confronting theory with evidence": theory testing and 'anomaly generation'. For many of the issues relevant to the management of wildlife and landscape there does not exist a market. In contrast to revealed preference data, stated preference data involves choices by economic agents evoked in hypothetical markets (cf. Hensher et al., 1999: 198). For instance, questions on the reasons and motives for the foundation of co-operatives indicated that were no revealed preferences available.

The surveys in this thesis were mainly applied to the methodological use of measurement (Boulier and Goldfarb, 1998: 11). This means measurement of facts of economic life (e.g. the number of farmers involved in wildlife and landscape management). Much of what applied economists do is measure things, including often exquisitely fine parameters said to stem from

[1] In general economists do not like using questionnaire surveys as a basis for doing empirical work (cf. McCloskey, 1983: 514 and cf. Carson et al., 1999: 1). Economists are trained to study behaviour by watching what people do (usually in markets), not by listening to what they say (Blinder, 1991: 90). In other words: economists have a strong bias in favour of estimates that are inferred from observed action, the revealed preference paradigm, as opposed to the stated preferences (Carson, et al., 2000: 5).

some maximising model. Measurement plays an important role with respect to transactions and therefore in the New Institutional Economics. However, measurement is not an easy task: researchers are confronted with measurement problems similar to those of contracting parties. The problems and costs of measurement pervade and significantly affect all economics transactions (Barzel, 1982: 48). The surveys had to deal with all kinds of measurement problems.

In order to develop useful survey questions good prior information was needed. Prior knowledge about the wildlife and landscape management by farmers was collected from multiple sources including annual reports, journal articles (secondary sources), farm accountancy data (primary source), contract data (primary source), and discussions with experts (secondary source). Secondary sources were also used either to add or check information. However, it should be kept in mind that lack of prior information and secondary sources are among the reasons for conducting surveys in the first place.

Although there is no explicit method for developing a survey and questionnaire in general, design is important for data quality (for survey design see: Churchill, 1999: 329; Dillman, 1991: 233; Korzilius, 2000: 16). Questionnaires are often not developed step by step but rather involve some iteration and looping (cf. Churchill, 1999: 329 and Korzilius: 2000: 17). The approach applied in designing the questionnaires followed Churchill (1999: 329), which implies that successive steps were taken in developing the surveys. Evaluation of the mail surveys in this thesis involved the following considerations (see also Dillman, 2000: 11):

1. Sampling error (Churchill, 1999: 572; Dillman, 1991: 227);
2. Non-sampling error (Churchill, 1999: 604);
    a) Validity (Churchill, 1999: 452; Korzilius, 2000: 25) or measurement error (Dillman, 1991: 228);
    b) Non-observation;
        - Non-coverage error;
        - Non-response error.

Sampling errors (Churchill, 1999: 572) refers to the variability in response. The sampling error is the difference between observed values of a variable and the long-run averages of the observed values in repetitions of measurement. Sampling errors result from heterogeneity of the survey

measures among members of the population. It is attributable to the fact that certain members of the population are deliberately excluded by selection of members for which responses are obtained (Dillman, 1991: 227). Sampling error is usually reduced by the simple expedient of increasing the sample size. Questions about the representatives of interview samples are relevant for all data users - also for economists who use data without caring about the source of the data.

Validity or measurement error is the first of the non-sampling errors to be discussed. Validity refers to whether survey respondents are answering the question the interviewer is trying to ask. Validity has two aspects: truthful answers and thoughtful answers. Measurement error refers to the discrepancy between underlying, unobserved variables (whether opinions, behaviours, or attributes) and the observed survey responses (Dillman, 1991: 228). Measurement error results from the process of observation. Measurement error may result from the respondent characteristics (e.g. their inability to provide accurate information or some motivation - for giving inaccurate information) or characteristics of the question or the questionnaire. If respondents have reasons to conceal the truth or mislead the interviewer, this objection limits the usefulness of interviews. However as long as people are not pathological liars, interviews may elicit useful information (Blinder, 1991: 90). This problem of truthful answering is also emphasised by Carson et al. (1999) by raising the following question with respect to surveys: what are the strategic incentives and how should they influence responses? The following types of surveys can be distinguished (cf. Carson et al. 1999: 3):

1. *Consequential*

   If the survey results are seen by the interviewee as potentially influencing actions of a business or government, and the agent cares about the outcome of that action, then the interviewee should treat the survey question as an opportunity to influence those actions. In the case of a consequential survey question, economic theory applies and the response to the question should be interpretable using mechanism design theory concerning incentive structures.

2. *Inconsequential*

   If the survey responses are not seen as having any influence on the decision of a business or government, or the interviewee is indifferent to all possible outcomes of the agency decisions, then all possible responses by the interviewee will be perceived as having the same influence on the final outcome. In the case of an

> inconsequential survey question, economic theory makes no predictions about the nature of the responses to the survey given by the interviewee.

The survey on contractual arrangements and the survey on environmental co-operatives are assumed to be inconsequential surveys because it is not likely that the interviewee considers the answers to both surveys to have influence on the decisions of the government. This implied that only minor attention was paid to incentive structure following our survey. Further, Blinder (1991) argues that the problem of thoughtful answers is more severe than the problem of truthful answers. Blinder (e.g. 1991: 91) believes that more pointed questions, posed in plain "English" (for this thesis Dutch), can elicit useful answers.

Two different non-observation errors are distinguished: non-coverage and non-response. Non-coverage errors arise because some members of the population are not covered by the sampling frame and therefore have no chance of being selected for the sample (Dillman, 1991: 227). For some research areas it is difficult to find an up-to-date listing of the population. For instance, it is difficult to find a list containing all farmers involved in wildlife and landscape management. Non-coverage is an important point of attention when judging surveys.

Non-response error is one of the well known problems of surveys. Non-response error stems from the fact that some of the members of the sample population do not respond to the survey questions (Dillman, 1991: 228). A lot of research on improving mail surveys has focused on response rates. However, a low response rate does not necessarily entail non-response error, i.e. a discrepancy between the frequency of a population characteristic and that estimated by the survey that occurs because some people did not respond. Those who respond to a survey may not differ in any measurable way from those who do not respond. However the general assumption is that the higher the response rate the lower the potential non-response error and therefore the better the survey (Dillman, 1991: 229). Many procedures and techniques are available to increase response rates; e.g. financial incentive, material incentives, follow-up reminder, questionnaire design, etc.

4.4 The contractual arrangement survey

This section deals with the survey among individual farmers in the Netherlands in 2001. The farmers in the sample concluded contracts with the government or environmental co-operatives for wildlife and landscape management in 1999. The survey was carried out among farmers in the Farm Accountancy Data Network (FADN) of the Agricultural Economics Institute (LEI) in the Netherlands. Only farmers were selected who were in the FADN-system in 1999. The reason for using this procedure was that a FADN-system change in 2000 resulted in a discontinuity in farm data. A second reason for surveying these farmers was that the regulation on wildlife and landscape management changed in 2000, which meant that 1999 was the last year of the old system of wildlife and landscape management contracting. Contracts concluded before 2000 were still running in 2001, hence the questions raised in 2001 were still relevant and farmers were still familiar with the system of contracting. Finally, in terms of contract design it is less important to be able to aggregate for the whole population of farmers managing wildlife and landscape in the Netherlands. For reasons of potential sampling errors it would have been better to have a large sample. But a larger sample would have been at the cost of having less information about each farm because a general survey among farms contracting for wildlife and landscape would have been necessary. This trade-off resulted in the choice of the relatively small sample and more available information, at cost of more precise answers.

In 2001, 32 farms were available for a survey. This is a rather small number of farms (potential non-coverage error), did not contribute the reliability of the answers for the total population of farmers managing wildlife and landscape. However, a number of reasons justified the decision to survey these farmers. First, a lot of information on economic variables was already available for these farms in the FADN, ranging from the number of animals to investment data. Measuring these variables in a survey would have meant a large investment. Further, it was not needed to ask questions for classifying the farmers. Beyond this, with help of the FADN it was still possible to compare farms participating in wildlife and landscape management and those which were not. The second argument is that the governmental agency responsible for administering and monitoring wildlife and landscape management contracts (DLG) allowed us to retrieve the contract data for the farmers involved.

The survey was carried out the period July 2001 - September 2001. Professional interviewers personally interviewed individual farmers. The survey was discussed and analysed by interviewers in order to avoid their misunderstanding the questions to be asked. After a positive assessment by experts in the field of wildlife and landscape management contracting, the questionnaire was tested. All the planned surveys were conducted. Hence, non-response errors were not a major problem.

In order to increase the validity a highly structured questionnaire was used. The survey consisted of three major parts: a general part, a specific part on wildlife and landscape management at the farm level, and a specific part on wildlife and landscape management contracting. These three parts consisted of questions that logically belonged together. The first part contained questions on the opinions of farmers on wildlife and landscape management, characteristics of the farmland parcels, and questions about risk and risk strategies. The first questions on wildlife and landscape management in the agricultural sector in general were meant to attract farmers' attention to the questionnaire. The second part, at the farm level, consisted of questions on labour input, investments, knowledge and education, and information. This part ended with a question on the risk attitude towards wildlife and landscape management. Part three consisted of questions on the specific types of wildlife and landscape management applied on a farm.

These questions on risk attitude are based on Coble et al. (1999). The farmers were asked to rate the importance of sources of income risk in their farm decision making on Likert-type scales ranging from one (not important) to five (very important). Nine potential sources of risk were included in our survey. In order to analyse how farmers perceive risk of a changing compensation for wildlife and landscape management compared to other sources of risk. To analyse sources of income risk for income from wildlife and landscape management we asked farmers to rate the importance of sources of risk related to the financial compensation from wildlife and landscape management compensation. Farmers were asked to rate their attitude to source of risk on similar Likert-type scales. This question was asked because whether farmers perceive wildlife and landscape preservation as an alternative for other strategies to reduce income risk at farm level.

Assessing answers as to truthfulness and thoughtfulness enhanced credibility. For the purpose of encouraging truthful answers the questionnaire was pre-tested among experts in the

field of wildlife and landscape management and individual farmers. The highly structured questionnaire prevented deviations from the central research concepts.

The design was to a large extent descriptive. A descriptive research study is typically concerned with determining the frequency of events or the relationship between variables (cf. Churchill, 1999: 99). The reason for this design was the focus on measurement of elements of the contractual relation like the number of hours worked or the investments carried out. Mainly multichotomous questions were used with often an "other" category for adding by the respondents alternatives that were not listed. This meant that the respondents were asked to choose the alternative most closely related to their position on the subject. In order to avoid obtaining the "other" category as an answer - making the question useless – it was tried to use an exhaustive list of alternatives. When the answers for the other category indicated that the number of categories, was not sufficient these "other" answers were incorporated into the analysis. For a minor number of topics dichotomous questions were used. The reason for using multichotomous and dichotomous questions was that quantification of the results is easier.

In a number of questions people were asked for their attitude towards contractual arrangements in general; risk attitude and strategies; and information availability. The approach was self-reporting, in which people are asked directly for their beliefs or feelings. For these questions an itemised rating scale was used (Churchill, 1999). The farmer had to select from five categories and labels were attached to the different categories ranging from totally unimportant to very important. An extra category was added for those cases in which farmers would had no opinion.

4.5 The environmental co-operative survey

This section deals with the mail survey of environmental co-operatives in the Netherlands in 1999. The survey was one of the first and most intensive surveys of environmental co-operatives. In the middle of 1999 the addresses of 81 environmental co-operatives were traced by using information from the government and farmers' organisations. Also according to the opinion of experts on environmental co-operatives this was the total number of environmental co-operatives in the Netherlands. By using several sources and by consulting experts the non-coverage error was reduced. Fourteen organisations were left out because they were being analysed by other researchers and/or at the moment of mailing had been recently visited. It was expected that these organisations would be biased in their answers due to a the recent survey and to their greater informational bias, since they were taking part in a research project. Of these 14 organisations 6 were randomly drawn from the total number of environmental co-operatives[2]. Eight organisations were taking part in a governmental experimental program on environmental co-operatives. However, looking at the organisation forms, year of formal foundation, and number of members no indication was found that the eight organisations biased our results. Ultimately, the mailing list consisted of 67 environmental co-operatives managing wildlife and landscape. All these organisations were mailed to; hence no sample was used of these 67 organisations.

The survey was sent to the environmental co-operatives at the beginning of April 1999. A small financial compensation was paid for the farmers' time filling out the questionnaire. Further, two (follow-up) letters were sent in order to try to improve the response rates. A first letter to remind the organisations of the questionnaire was sent at the end April 1999. A second reminder was sent in mid-May 1999. When looking at the organisations mailed to, the response-rate was 61 % (number of completed interviews with responding units/number of mailed organisations mailed to). The non-response can be partly be explained by the following factors:

1. A number of addresses proved not to be correct (10%);
2. Some associations replied that their organisation was not really active, so that they were not able to fill in the questionnaire (5%).

[2] Personal communication G.C. van Eck, IKC-Landbouw

No indication was found that the sample was not a random and representative sample of the whole population due to these two factors. Mailing all environmental co-operatives reduced sampling errors. This was manageable due to the fact that the number of co-operatives was rather small (81 organisations). This meant that it was impossible to make a judgement about an appropriate sample size.

The design of the survey was to a large extent descriptive. A descriptive research study is typically concerned with determining the frequency with which something occurs, or the relationship between two variables (Churchill, 1999: 99). Further, the survey can be characterised as a cross-section. The reason for this design was that there were no good alternative primary sources available giving characteristics of these organisations, the number of people involved, the way they are organised, etc.

The survey contained several sections addressing different topics. The questions within the topics were chosen in such a way that the topic formed a logical group of questions. The survey started with questions on reasons for starting and its objectives, based on the explanations from New Institutional Economics. These questions were formulated in such a way that they were easily understandable as well as interesting for the farmers because they could tell about what they do. The next category of questions was general economic indicators: the organisational structure and activities of the environmental co-operative. These questions at the beginning of the questionnaire because they were an essential objective of the survey because this type of information was not known before. The questionnaire continued with questions on the motivation of the members and the help that the organisation gets from external sources. These questions were meant to give more insight into organisational problems. To examine the activities and contractual arrangements questions on monitoring and sanctions were asked. Since financial resources are important questions were asked about the funding of the organisation and its activities. Finally the organisations were asked about their co-operation with the government and other organisations and how they see their own role in relation to their members and the government.

To measure all kinds of characteristics of environmental co-operatives mainly multichotomous questions were used (Churchill, 1999: 342-349). These close-ended answers increase the comparability of the answers. An open-ended "other" category was included for the respondents' own alternatives that were not listed. This means that the respondents were asked to

choose the alternative most closely related to their position on the subject. In order to avoid obtaining the "other" category as the answer (making a question useless) it was tried to provide an exhaustive list of alternatives. The answers to the "other" categories are mentioned in the results when significant. For a minor number of topics dichotomous questions were used (Churchill, 1999: 349-350).

In four questions people were asked for their attitude toward specific elements of the environmental co-operative. The approach was self-reporting, in which people are asked directly about their beliefs or feelings regarding the reasons for founding the organisation, the importance of several activities and tasks, and the factors important for the success of the organisation. For these questions an itemised rating scale was used (Churchill, 1999: 404). The representative of the environmental co-operative had to select from 5 categories and labels were attached to the different categories ranging from totally not unimportant to very important

4.6 Summary and conclusions

This thesis focuses on land use in which agriculture is combined with managing wildlife and landscape. The objective of this thesis is to analyse the design of contractual arrangements for wildlife and landscape management by farmers. The methodology applied in the thesis is illustrated by the research process of the project. The research process consisted of three stages: (1) development of an initial theoretical framework and conceptual model for institutional analysis; (2) the analysis of empirical objects; (3) a final analysis. The empirical areas of this thesis were (1) a direct relation between individual farmers and public and/or private contractors and (2) an indirect relation between farmers and public and/or private contractors. An important method used in this thesis is a literary approach combined with statistical tools using data from mail surveys. The surveys were evaluated taking into account the sampling and non-sampling errors. Other methods were formal models concerning the decision to contract and the consequences of contracting at the farm level.

PART II CONTRACTUAL ARRANGEMENTS FOR WILDLIFE AND LANDSCAPE MANAGEMENT INVOLVING INDIVIDUAL FARMERS

Chapter 5

Wildlife and landscape management: individual contracting

5.1 Introduction

In this chapter the design of contracts involving individual farmers is analysed. Contract design is the way the contract is set up: what incentives, degree of completeness, contract duration, etc. The existing literature on wildlife and landscape contracting focuses on factors explaining the decision to conclude contracts, e.g. Crabtree et al. (1998: 312); Beedel (2000: 120-121); Wenum (2002: 69); and Wynn et al. (2001: 78). These studies normally contain a single equation covering several aspects that are thought to be relevant to the decision to contract. They often focus more on characteristics of farms and farmers and less on institutional issues. This chapter addresses the decision to contract more from the perspective of institutional economics.

The first question to be analysed is which institutional characteristics at the farm-level influence the decision to contract for wildlife and landscape management. Following transaction cost economics, this decision to conclude contracts depends on the following key dimensions of a transaction: asset specificity, uncertainty and frequency (see Section 3.4). If a contractual arrangement is not appropriate - given these key-elements - a transaction will not take place. In this chapter the focus is on asset specificity given the measurement problems concerning the other two dimensions for farms who do not manage wildlife and landscape. The main source for data used for this question is the Dutch Farm Accountancy Data Network (FADN).

A second question examined in this chapter is how to characterise contractual arrangements for wildlife and landscape management. The actual choice for an institutional arrangement is analysed in more detail. Special attention is given to the complexity of the transaction and the sources of transaction costs. Data are used from a survey on wildlife and landscape management by farmers, combined with data from the FADN.

The questions are analysed separately because the farmers who do not sign contracts are relevant to the first question but not to the second. Section 5.2 examines the decision to contract, as well as that of not to contract, on the part of farmers. The second question concerning actual transactions is analysed in Section 5.3. Section 5.4 discusses the empirical model and data for the decision to contract Sections 5.6 and 5.7 assess the results concerning both research questions. The chapter finishes with a summary and conclusions in Section 5.8.

5.2 The decision to contract

In the period before a contract is concluded the parties to the contract have no obligations to each other and are free to conclude a contract or not. Parties to a contractual arrangement will choose to contract if the expected gains from doing so are greater than those of organising the transaction in some other way (cf. Masten and Saussier, 2000: 2; Masten, 1996: 47). Besides the choice of an institutional arrangement (organisational mode) it needs to be decided whether a transaction should be carried out given the characteristics of the farm (technology mode). Technology and organisational modes ought to be treated symmetrically within modelling; they are decision variables whose values are determined simultaneously (cf. Williamson, 1985: 89). Chapter 6 concentrates additionally on issues related to co-operation.

The choice of concluding wildlife and landscape management contracts on a farm is a revealed preference that can be observed. However, alternative institutional arrangements that are not chosen are not observable, as are the transaction costs of alternative institutional arrangements. Thus, even if the transaction costs could be adequately measured, the costs that would occur if the same transaction were governed under an alternative arrangement cannot be observed (cf. Masten, 1996: 45). The same is true for farmers who did not choose managing wildlife and landscape: it is impossible to know what the transaction costs would be if they decided in favour of managing. Therefore the choice for managing wildlife and landscape has to be related to observable dimensions of a (potential) transaction.

Analysing the decision to contract, it is focused on specific investments. Depending on the level of specific investments (or sunk costs) made by the different parties to institutional arrangements, parties are "locked in" to different degrees after concluding the contract. Specific

investments cannot easily be transferred to service alternative partners, so they are less valuable if the relationship is discontinued. Depending on the degree of asset specificity, the expropriation of the residual income of one party by another is quite conceivable. The question is whether the contractual safeguards protecting specific investments of farmers are large enough to protect these investments against potential ex post expropriation of the residual income. The same is relevant for governmental agencies, environmental co-operatives and others: protecting investments against expropriation of residual income by farmers.

A transaction for wildlife and landscape management should involve less specific investments if the farm is already well-adapted to the transaction or when farmers have knowledge that makes them relatively better able to carry out the transaction. Following transaction costs economics, the benefits of a contracting arrangement are expected to increase with the value of relationship-specific investments. Higher levels of asset specificity make the market less attractive as institutional arrangement. This means that the design of a contractual arrangement should be tailored to the transaction of the government (or environmental co-operative) and farmers want to conclude.

Asset specificity is difficult to measure and proxy variables are often used in empirical research (cf. Shelanski and Klein, 1995: 338). The approach in this chapter tries to overcome this problem by using an alternative approach. Asset specificity for wildlife and landscape management are examined indirectly by using farm characteristics as explaining factor. These farm characteristics determine the need for specific investments when a farmer would conclude a contract. It is assumed that variation in (potential) specific investments is related to variation in the need for adaptations in case of wildlife and landscape management given the farm characteristics. For farmers who are actually managing wildlife and landscape the farm characteristics are an indirect approximation of asset specificity. If wildlife and landscape management fits the farm characteristics few asset specific investments will be needed.

A contract opportunity should be available to individual farmers willing to conclude contracts. In other words: a contracting partner is needed to set up an institutional arrangement for managing wildlife and landscape. Regions in which contracting opportunities are available can be called contracting regions. Governments or environmental co-operatives establish the locations and borders of these regions. Opportunities for contracting are created in regions by governmental agencies, environmental co-operatives, and or others such as provincial

administrations. Contracting regions are expected to be located in regions where the opportunities for wildlife and landscape management are better. However, there may also exist farmers with similar production circumstances but outside these regions, who can manage wildlife and landscape as well as farmers within them. A second aspect is time. Contracts can only be concluded when a contracting party has created the possibility. Before this point in time contracts for wildlife and landscape management concluded with the government or environmental co-operatives cannot be observed. In the course of time supply of wildlife and landscape management contracts should increase due to new possibilities opened by contracting parties. This means that wildlife and landscape management on farms is partly driven by the supply of contract possibilities. Time and region are taken into account in our empirical model.

5.3 After a contract for wildlife and management has been concluded

The objective of this section is to develop elements relevant for describing transactions. These elements are used to characterise wildlife and landscape management transactions. The following elements of wildlife and landscape management are examined in this chapter:

1. incomplete institutional arrangements;
2. specific investments for wildlife and landscape management;
3. property rights to wildlife and landscape;
4. uncertainty and risk;
5. transaction costs.

Incomplete institutional arrangements

Following the transaction costs approach, an incomplete contract will be concluded. According to Saussier (2000b: 192) in his definition of feasible completeness, one contract is more complete than another if it gives a more precise and complete definition of the transaction and of the means to carry it out. An upper limit can be imagined as the complete contract which specifies how to perform the transaction in every cconceivable case. The degree of incompleteness for wildlife and landscape contracts of a standard institutional design depends on the transaction at stake. In other words, for a simple transaction the same contract design is more complete than for a more complex transaction.

Incomplete contracting will lead to benefits and costs. Writing and accepting incomplete contracts means that the costs and benefits are equal at the margin. There is a trade-off between the marginal cost of writing a more complete contract, and writing a more incomplete contract. The advantages for the government or environmental co-operatives of writing more complete contracts for wildlife and landscape management are: (1) given the involvement of specific investments, a reduced exposure to the opportunism of the other party; and (2) savings on repeated renegotiating costs (cf. Saussier, 2000b: 193). This implies that the parties to a contract are exposed to more opportunism in contracts involving more specific investments, compared to contracts with less specific investments, in a contract with the same institutional design. The more the contract specifies the transaction, the smaller the probability that the contract will be renegotiated (Saussier, 2000b: 193).

Analysis of the transaction to determine the degree of completeness cannot be done without looking at the complexity of the transaction at stake. The design of contractual agreements depends in part on the degree of complexity and uncertainty associated with the transaction. The more complex the transaction the harder it becomes to describe fully and accurately the responsibilities of each party in a contract, and the more difficult it will be to assess whether those obligations have been fulfilled (cf. Masten, 1996: 14). Complexity will increase if more types of transaction are handled by one arrangement. If contracting partners only trade one uniform good or service the institutional arrangement will be less complex than in situations where combinations of transactions are governed implying one big transaction. Data on organisational form and contract terms is only useful to the extend that they can be matched with

data on attributes of transactions (cf. Masten, 1996: 48). However the problem of matching data is sometimes difficult to solve given joint production and in addition the potential involvement of farmers in more than one arrangement[1].

Property rights to wildlife and landscape

Important with respect to wildlife and landscape contracting is the distribution of property rights. This means that it depends on the property rights to wildlife and landscape who the owner of investments in wildlife and landscape shall be. The question is who has the residual control rights to wildlife and landscape on farmland (see Table 2.1). If the residual control rights are more in the hands of the society than the farmers, investments are specific by definition. When a farmer invests in an asset for which he does not posses all the residual control rights, he will be confronted with a potential hold-up problem concerning these investments.

Uncertainty

The contracts offered by the Dutch government and environmental co-operatives for wildlife and landscape preservation have fixed contract duration which is known to both parties when the contract is formally concluded. Contract duration for these governmental contracts is not an outcome of negotiations between the parties to a contract. However, given the provision of different kinds of services within these contracts (differences in asset specificity, uncertainty and frequency) contract theory would suggest contracts with varying contract duration. Following contract theory, some transactions are expected to be less appropriate for contracting arrangements because of unattractive contract duration. The duration of a contract can be analysed as an optimisation process in which costs and benefits of additional length are traded-off at the margin (Saussier, 1999: 5). A long-term contract involving specific assets of one party leads to a reduced exposure to the opportunism of the other party. Further, a longer-term contract leads to savings on negotiation costs. On the other hand longer-term contracts lead to a greater

[1] Aspects related to the collection of the data are discussed in chapter 4.

risk of being trapped in a bad contract. This problem is more serious the greater the uncertainty concerning the transaction.

Transaction costs

Institutional arrangements involve transactions costs. In this section *ex ante* and *ex post* transaction costs are distinguished (Williamson, 1985: 20). The first are the costs of drafting, negotiating, and safeguarding an agreement. The second, *ex post* transaction costs, include the running costs of the institutional arrangement. Transaction cost hypotheses require data on organisational form as well as detailed information about the character of transactions as the level of uncertainty associated with exchange, the complexity of products and processes, and the extent to which assets needed for production are specific to the particular relation (Masten, 1996: 47). In the empirical section it was tried to show the differences of transaction costs between different transactions.

5.4 Empirical model and data: the decision to contract

Contracting for wildlife and landscape management is assumed to be dependent upon specific investments, the region of the farm, and time. Contracting is a censored variable because "wildlife and landscape management" has zero values if no wildlife and landscape is managed and has only positive values in case of wildlife and landscape management. Because of this censored characteristic the following Tobit model is estimated (cf. Baltagi, 2001: 212; Verbeek, 2000: 340):

$$y_{it}^{*} = x_{it}\beta + \mu_i + \upsilon_{it} \qquad (1)$$

where *"i"* indexes individual farmers such that i=1,2,3,...,N; and, "t" indexes the year such that t=1990, 1991, 1992, ... , 1999. The variable y_{it}^{*} represents the quantity of wildlife and landscape management for those farmers who are involved in transactions. The matrix x_{it} contains data on the observable explanatory variables (including a constant term) of the model for farm i in the year t. The variables of this matrix are given in Table 5.1. The variable y_{it}^{*} is not observed when no wildlife and landscape is managed. For those farmers who do not manage wildlife and

landscape y_{it}^{*} is set to zero. The observed random variable y_{it} is related to the latent variable y_{it}^{*} by

$$y_{it} = y_{it}^{*} \quad if\ y_{it}^{*} > 0$$
$$y_{it} = 0 \quad if\ y_{it}^{*} \leq 0 \tag{2}$$

The following equation is estimated

$$y_{it} = \begin{cases} x_{it}\beta + \mu_i + \upsilon_{it} & if\ y_{it}^{*} > 0 \\ 0 & if\ y_{it}^{*} \leq 0 \end{cases} \tag{3}$$

The independent variable y_{it} is wildlife and landscape management. The error term υ_{it} is independent over time and farms and captures stochastic disturbances. The unobservable random farm effects (μ_i) do not vary in time and capture relevant unobservable variables and time-invariant factors that characterise farm i. They are assumed to be normally distributed with zero means and variances of $\sigma_{\mu_i}^2$ and $\sigma_{\upsilon it}^2$ (Verbeek, 2000: 340). It is assumed that there is no relationship between the explanatory variables and the error terms. It is further assumed that there is no dynamic feedback from the past and future realisations of explanatory variables to the current realisations of wildlife and landscape management. In order to assess the importance of the explanatory variables marginal effects (cf. Greene, 1997: 963-964) are calculated for the expected value of wildlife and landscape conditional on being positive (uncensored) and the marginal effect for the probability of being uncensored.

Data

Data on specialised dairy farms covering the period 1990/91 - 1999/00 are from a stratified sample of farms keeping accounts on behalf of the Dutch Agricultural Economics Research Institute (LEI) farm accounting system. The stratification is based on economic farm size, age of the farmer, region, and type of farming. Annual data on participating farms are available. In the sample (very) small farms and non-specialised farms are not represented. Data are used from Dutch dairy farms that have more than 50 per cent of their Dutch standard gross margin (sgm) from dairy farming[2]. The farms usually remain in the panel for about five years, so the data set forms an incomplete (or unbalanced) panel.

[2] See CBS/LEI Landbouwcijfers 2000 for norms on sgm for different products

The data set used for estimation is built up in the following way. First, those farmers are selected who manage wildlife and landscape. Second, farmers who are not managing wildlife and landscape during the estimation period are added. These farmers are not selected randomly, but in order to increase the probability that the farmers have the opportunity to manage wildlife and landscape, only those are selected who are located in a municipality in which farmers actually manage wildlife and landscape. Farmers are at least two years in the set. The data set used for estimation contains 1489 observations on 302 farms. Of these farms 190 did not manage wildlife and landscape at all in the period 1990/91-1999/00. Table 5.1 gives an overview of the data used for estimation for the year 1999/00.

*Table 5.1: Overview of data used for estimation (n=128, prices of 1991), 1999**

Mean	Mean	Std. Err.
Wildlife and landscape management (1000 €)	1.34	2.85
Milkproduction per ha (1000 €/ha)	4.27	1.69
Labour input (100 hours)	41.41	15.99
Land input (ha)	42.79	22.95
Age farmer (number of years)	50	11.66
Non agricultural land (% non agricultural land/total land)	5.48	3.42
Specialisation level dairy farming (Dutch standard gross margin (sgm) dairy farming/sgm total)	79.39	8.80
Nitrogen use per ha (kg/ha)	215.81	68.57
Dummy for soil type peat (1 if peat)	0.094	
Dummy for soil type clay (1 if clay)	0.41	
Dummy water drainage (1 if moderate or bad)	0.21	
Dummy Friesland (1 if farm is located in province Friesland)	0.23	
Dummy Zuid-Holland (1 if farm is located in province Zuid-Holland)	0.14	
Dummy Overijssel (1 if farm is located in province Overijssel)	0.094	
Dummy sheep (1 if present on farm)	0.23	
Dummy beef cattle (1 if present on farm)	0.43	
Dummy low productive cows (1 if applies to dairy stock)	0.15	
Dummy environmental programs (1 if participating)	0.14	
Dummy quality producing programs (1 if participating)	0.87	
Dummy successor for certain (1 if yes)	0.41	
Dummy agricultural education (1 if yes)	0.52	
Dummy roughage purchases (1 if yes)	0.81	

*Source: FADN, * Estimations are carried out with guilders*

The dependent variable "wildlife and landscape management" is equal to the financial compensation farmers receive. It is assumed that wildlife and landscape management can be expressed in kilo fodder unit milk (kFUM) (energy content of dairy fodder). Using the price for a kFUM the dependent variable was made real. Wildlife and landscape management contracts lead to a decrease in production of grass expressed in kilo fodder unit milk per ha (kFUM, energy content of dairy fodder; Heinen, 1997: 3). Transactions differ in the reduction of the production of grass because they differ in prescriptions for managing wildlife and landscape. For example, there are five contracts possible for reproduction periods possible that differ in the date the nesting period ends: June 1, June 8, June 15, June 22, and June 30. The starting date is the same for all these contracts: April 1. As the meadow bird reproduction period gets longer the decrease in kFUM is larger; hence the more "wildlife and landscape management" is produced. The financial compensation per kFUM can change every year, also for contracts that were concluded in previous years. The differences in operating inputs per contract are not corrected and it is assumed that differences in operating inputs can also be expressed in kFUM.

For farm characteristics related to asset specificity the following proxy variables are used:

1. Farm characteristics for site specificity:
   - Dummy for soil type peat and dummy soil type clay.

     The majority part of the farms had a soil type of sand, followed by clay and peat. Soil types influence the need for specific investments because the possibilities for wildlife and landscape management depend on the soil type. If the soil is better adapted to a way of farming including wildlife and landscape management less specific investments are needed.
   - Non agricultural land.

     Non-farmland like farmyard, paths, roads, forest land, etc. as a share of total land holdings are expected to increase the probability that farmers have land that is fitted for wildlife and landscape management.
   - Nitrogen use per ha.

     Nitrogen fertiliser intensity indicates a more intensive way of producing and therefore more investments are needed to manage wildlife and landscape and therefore a negative sign is expected.

- Dummy water drainage.

  Farmers conclude more wildlife and landscape management contracts on land where drainage is moderate or bad. If land drainage is moderate or bad less specific investments are needed to switch from the current production technology to wildlife and landscape management.

2. Farm characteristics for physical asset specificity:
   - Specialisation level dairy farming.

     A higher level of specialisation in dairy farming means more specific investments in order to switch to wildlife and landscape management because the adaptation needed will be larger.
   - Dummy low productive cows.

     Low producing cows makes that less specific investments are needed and switching would be easier.
   - Milk production (1000 €) per hectare.

     At high production intensities, the possibility of feeding roughage from grassland with wildlife and landscape management agreements to young stock and dry cows restricts the amount of wildlife and landscape management. At high stocking rates, the possibility of grazing cows during the growing season restricts the area with management agreements (cf. Haan et al., 1996: 23).
3. Farm characteristics for human asset specificity:
   - Dummy environmental programs and dummy quality producing programs.

     Both variables are meant to signal experience with contracting and this makes the decision for wildlife and landscape management easier.
4. Farm characteristics for dedicated assets:
   - Dummy roughage purchases.

     Buying roughage indicates already a shortage of feed, making more adaptation on farm level necessary.

- Land.

  Grassland for grazing must remain available during the growing season (cf. Haan et al., 1996: 23). More land means more land for grazing and fewer problems of fitting in wildlife and landscape management on a farm. A positive sign is expected.

Other variables in the model are related to time; location and farm characteristics:

1. Year dummy for the years 1991 to 1999. The dummy for 1991 has a value of 1 if the year is 1 and has a value zero elsewhere. The other dummies for years are calculated in the same way.
2. Dummies Friesland, dummy Overijssel, and dummy Zuid-Holland

   These dummies are meant to express regional differences for contracting. These dummies have a value of 1 if for a specific province and are 0 elsewhere. In order to prevent correlation with soil types, provinces are used for regional differences and appointing areas for wildlife and landscape management by farmers is a task of the provinces.
3. Dummy sheep and dummy beef cattle

   Dummies for the presence of beef cattle (grazing) and sheep are added to analyse complementarities or substitutes to wildlife and landscape management.
4. Labour
5. Age
6. Dummy agricultural education

   The dummy has a value 1 if a farmer has an education in agriculture.
7. Dummy successor for certain

   The dummy has a value of 1 if a successor exists for certain.

5.5 Results: the decision to contract

In this Section the results of the Tobit model (Equation 3) on the decision to contract will be presented. The estimation results are presented in Table 5.2.

Table 5.2: Tobit estimates of wildlife and landscape management model, random effects, 1990-1999

Parameter	Estimate	Std. Err.	Parameter	Estimate	Std. Err.
Constant**	-15.23	3.34			
Farm characteristics for site specificity:			***Time:***		
Dummy soil type clay	-0.33	0.83	Dummy 1991	0.0099	1.14
Dummy soil type peat*	1.84	1.11	Dummy 1992*	2.27	1.12
Non agricultural land**	0.24	0.064	Dummy 1993**	4.31	1.13
Nitrogen use per ha**	-0.013	0.0034	Dummy 1994**	4.40	1.14
Dummy water drainage**	4.05	0.66	Dummy 1995**	5.77	1.15
Farm characteristics for physical asset specificity:			Dummy 1996**	6.95	1.16
Specialisation level dairy farming	0.037	0.035	Dummy 1997**	7.91	1.19
Dummy low milk-productive cows	-0.22	0.89	Dummy 1998**	9.15	1.28
Milk-production per ha	-0.18	0.11	Dummy 1999**	10.88	1.38
Farm characteristics for human asset specificity:			***Other variables:***		
Dummy environmental programs	-0.50	0.65	Age	-0.022	0.028
Dummy quality producing programs	-0.60	0.76	Dummy successor for certain*	-1.36	0.068
			Dummy agricultural education*	1.34	0.58
Farm characteristics for dedicated assets:			Labour	-0.00011	0.00029
Dummy roughage purchases*	1.36	0.58			
Land**	0.079	0.22	Dummy sheep	0.49	0.67
			Dummy beef cattle**	-1.80	0.47
Provinces:					
Dummy Friesland**	-2.30	0.86			
Dummy Overijssel	-1.43	1.18			
Dummy Zuid-Holland	-1.13	0.89			

*Source: FADN, * variable significant at .10 level, ** variable significant at 0.01 level*

The discussion of Table 5.2 starts with those variables that are not significant at a 1% level. The variables related to physical assets are not significant for a 1% level indicating that the level of specialisation in dairy farming is not an explaining factor for managing wildlife and landscape. Also the presence of low productive cows is not significant. Milk-production per hectare, indicating the possibilities of fitting in wildlife and landscape is not significant different from zero for a 1% level. This lead to the conclusion that wildlife and landscape does not depend significantly on physical asset specificity. The variables farm characteristics for human asset

specificity were not significant either. This means that familiarity with contracting for other purposes do not imply that more contracts for wildlife and landscape management are concluded. The availability of labour seems not to influence the decision to contract (here and in the following statements significance of the 1% level has been used for determining whether or not a variable had a clear inference). The coefficient of the presence of sheep does not indicate that sheep are either substitute or complement for wildlife and landscape management. Age has no influence of wildlife and landscape management. An agricultural education seems to have a positive effect on the decision to conclude contracts but not at a 1% significance level. The presence of a successor for certain has a negative sign. This sign can be explained by relative short time horizon of the farmer knowing that he/she has a successor.

The stability of the estimates is checked using different numbers of quadrature points for the Gauss-Hermite quadrature procedure. Some estimates of coefficients were relatively unstable. The model is estimated again excluding variables that were not significant for a 1% level[3]. Table 5.3 gives the results for this second estimation.

Table 5.3: Tobit estimates of restricted wildlife and landscape management model, random effects, 1990-1999

Parameter	Estimate	Std. Error	Marginal effect expected value	Marginal effect probability
Constant**	-18.42	1.73		
Farm characteristics for site specificity:				
Non-farmland**	0.19	0.064	0.043	0.0057
Nitrogen use per ha**	-0.010	0.0034	-0.0023	-0.00030
Dummy water drainage**	4.82	0.70	1.15	0.15
Farm characteristics for dedicated assets:				
Land**	0.13	0.019	0.029	0.0038
Provinces:				
Dummy Friesland	-0.20	0.93	-0.043	-0.0058
Time:				
Time trend**	1.22	0.091	0.27	0.036
Farmer characteristics:				
Dummy beef cattle**	-2.10	0.49	-0.46	-0.061

*Source: FADN, ** variable significant at 0.01 level*

[3] Estimating the model while excluding variables at a level of significance of 10% lead to non-stable estimates.

Comparing the results of Table 5.3 to the results of the first estimation in Table 5.2 shows that the signs of the coefficients did not change. An alternative to the dummies for the subsequent years is a time trend variable. The time dummies in the model were tested whether they result in a different effect:

$$H_0 : \alpha_1 = \alpha_2 - \beta = \alpha_3 - 2\beta = \alpha_3 - 3\beta = \alpha_4 - 4\beta = \alpha_5 - 5\beta = \alpha_6 - 6\beta = \alpha_7 - 7\beta = \alpha_8 - 8\beta$$
$$H_1 := \textit{not true}$$

where $\alpha_i \quad (i = 1,...,7)$ are the coefficients for the subsequent dummies and β is the coefficient of the time trend. The null hypothesis is not rejected at a 1% level of significance (Wald test, $\chi^2_6 = 3.89$). This results in a choice for a model with a time trend variable because of the higher degrees of freedom. Checking the stability of the estimates using different numbers of quadrature points for the Gauss-Hermite quadrature procedure shows that the stability of the estimates improved, however, the coefficient for Dummy Friesland was still relatively unstable implyin1g that the results should be interpreted with care. However, the signs of both estimations are consistent. The marginal effects in Table 5.3 are the effects for the expected value of wildlife and landscape conditional on being positive (uncensored) and the marginal effect for the probability of being uncensored.

Farm characteristics related to site specificity are important for the decision to manage wildlife and landscape: the variables non-farmland, nitrogen use per hectare, dummy water drainage differ significantly from zero for a 1% level of significance. Farms with relatively more non-agricultural land are more likely to conclude wildlife and landscape management contracts. The probability increased with about 0.0057 when the share non-farmland increases with one per cent (column 5, Table 5.3). If a farm is already managing wildlife and landscape one additional per cent non-agricultural land leads to an increase in wildlife and landscape of about € 43. High levels of nitrogen use indicate higher production of roughage per hectare. Wildlife and landscape management will lead to an extra reduction of roughage production for high levels of nitrogen use per hectare compared to lower levels. If wildlife and landscape management implies no nitrogen use, the effect for high levels of nitrogen per hectare is larger and will lead to more difficulties fitting in a contract resulting in a decrease of the probability with 0.0003.

From Table 5.3 it follows that moderate or bad water drainage leads to more wildlife and landscape management: about € 1150. In case of moderate or bad water drainage the probability

of wildlife and landscape management increases by 0.15. Switching to wildlife and landscape management is easier if water drainage is bad because fewer adaptations on farm-level are needed. The positive sign for land is explained by the fact that more land means more opportunities for fitting in wildlife and landscape management on a farm and therewith more wildlife and landscape management: an additional hectare increases revenue by € 29. The effects of an extra hectare are rather small (marginal probability effect is 0.0038).

From the model follows that farm characteristics related to specific investments are important for the decision to conclude contracts. In contradiction to the expectation formulated in Section 5.2 the region is not important. Looking at a level of significance of 1% the coefficient for the Dummy Friesland was no longer different from zero. The others were not significant in the first model. This lead to the conclusion that the distinguished regions are not important for concluding contracts.

However, time is important for wildlife and landscape management following from the dummies for the subsequent years. The probability to conclude contracts increases with the years and the amount of wildlife and landscape managed. It is expected that the dummy represents the increase in contracting opportunities due to the activities of governmental agencies and the origination of environmental co-operatives. Another important explanation is that farmers changed their attitudes towards wildlife and landscape management.

Beef cattle are a substitute for wildlife and landscape management given the negative sign for this coefficient. These cows are expected to compete for the same land for their feed.

5.6 Results: after a contract for wildlife and landscape management has been concluded

Before going into details concerning the results of the survey among individual farmers involved in wildlife and landscape management, farms in the survey are described, based on of the FADN[4]. The 32 farms surveyed are compared to all farms in the FADN managing wildlife and landscape because the 32 farms are part of it. In 1999, the whole FADN set contained about 90

[4] The survey among individual farmers is discussed chapter 4.

farmers managing wildlife and landscape. Table 5.4 gives an overview of general characteristics of the farms in the sample.

The average compensation of the sample is about € 2000. This compensation is lower than the average compensation for all farmers in the FADN producing wildlife and landscape (circa € 2900). The compensation received varies between € 200 and about € 9500. The compensation as a percentage of the milk-output differs among farms. For the 32 farms this percentage ranges from about zero to more than 31%.

Table 5.4: Characteristics of farms in the mail survey compared to all farms in the FADN managing wildlife and landscape (prices 1991), 1999[5]

	Mean	Standard deviation	Min	Max
Average compensation received (€ 1000)				
• 90 farms	2.9	3.9	0.01	18.9
• 32 farms	2.0	2.2	0.2	9.5
Average compensation received as percentage of milk output				
• 90 farms	6.3	10.5	0.02	63.4
• 32 farms	3.7	5.7	0.08	31.6
Farmland (ha)				
• 90 farms	42.3	20.7	7.2	103.0
• 32 farms	44.7	21.5	15.8	103.0
Average number of cows				
• 90 farms	76	36	13	224
• 32 farms	81	41	36	224
Age				
• 90 farms	47	11.1	28	77
• 32 farms	48	10.8	29	68

Source: FADN

The farms in the survey sample are on average larger than the average farm size of all 90 farms in the FADN. The average age of the farmers surveyed was 48 and ranges from 29 to 68. Testing for differences between the 32 farms and all 90 farms for the average compensation received and the compensation as a percentage of milk output shows that these values are larger for the 90

[5] The average compensation differs with Table 5.1 for reason of sampling. Table 5.1 consists also farmers who do not manage wildlife and landscape: about 50 per cent did not manage wildlife and landscape in 1999.

farms (t-test on averages, H_0: no difference and H_1: positive difference, probability level: 0.0503, leading to a rejection of H_0). Testing on differences between the 32 surveyed farmers and the 90 farmers revealed no differences for farmland, average number of cows and the age of the farmer. The 32 farms are representative although the level of compensation is below average. About 30% of the farmers knew already that they would have a successor. This percentage can partly be explained by the relatively young age of some farmers making this question for those farmers not (yet) relevant. Non of the 32 farmers had recreational activities. A large majority of the farmers was involved in a chain label program.

Incomplete institutional arrangements

The results of the survey show that farmers are involved in different institutional arrangements for wildlife and landscape management at the same time. Looking at the contracting parties, three categories of arrangements can be distinguished: central governmental agencies (DLG-contracts), environmental co-operatives, and other parties. These categories are given in Table 5.5.

Table 5.5: Institutional arrangements for wildlife and landscape management by farms categorised by the parties involved other than farmers (n=30), 1999

Contracting partner	Number of farmers involved	One contract partner	Average compensation (€)
Governmental agencies	20	13	1855
Environmental co-operatives	12	9	1280
Other partners	8	3	581

Source: questionnaire data

The majority of the farmers in the sample was involved in a contractual relationships with Dutch governmental agencies within the national regulation of wildlife and landscape management (20 farmers). A smaller number of farmers was involved in an environmental co-operative. The group of "other partners" was rather diverse, ranging from provinces to wildlife and landscape conservation organisations. The average financial compensation for farmers involved in an institutional arrangement with other parties was less than half of the average compensation for

the other two contracting partners. Many farmers were involved in an institutional arrangement with only one contracting partner.

Looking at the type of arrangements, four main transactions were distinguished in Chapter 3: preservation, development, maintenance and products delivered. Table 5.6 gives the results for these transaction categories in our sample. A single contracting arrangement can consist of more than one of these transactions. The category "other transactions" consists of transactions that could not be attributed to a single category.

Table 5.6: Transaction types for wildlife and landscape management categorised according to contracting arrangements (n=30), 1999

Transaction	Number of farmers involved	Number of farmers involved in this transaction only
Preservation	8	1
Development		
• Delay of first cut of grassland	7	2
• Field margin management	8	1
Maintenance	4	0
Products delivered	5	1
Other transactions	7	2
Total	30	7

Source: questionnaire data

Table 5.6 illustrates the diversity of contracting types. The majority of the farmers was involved in several transaction types at the same time. Several transactions within one arrangement has consequences for the arrangement and the related contracts because the arrangements have to deal with the differences in attributes of the transactions. Combining contracting partners and transaction types results in Table 5.7.

Table 5.7: Transactions and contracting parties for wildlife and landscape management (n=30), 1999

Transaction / Contracting partner	Preservation	Development	Maintenance	Products delivered	Combinations
Governmental agencies	1	4	0	1	7
Environmental co-operatives	0	5	0	0	3
Other partners	0	2	1	0	6

Source: questionnaire data

Table 5.7 (column 2) shows that farmers were involved in respectively 4, 5 and 2 transactions for development of wildlife and landscape with government agencies and environmental co-operatives. Further, combinations of transactions were relevant for farmers involving all the types of contracting partners distinguished ("combinations", last column of Table 5.7). Farmers can conclude different types of contracts with more than one contracting partner. This increases the complexity of the contractual relation.

Categories of specific investments

Concerning physical asset specificity the main question is whether farmers buy special equipment for wildlife and landscape management that cannot be used for other purposes. The assets can be distinguished with respect to the degree of asset specificity. This means that farmers could buy equipment that is used for special species - e.g. nest protection equipment - or for several types of wildlife and landscape management like fencing posts and wire. For fencing posts and wire the degree of specificity changes if they are actually in use at a farm and can only be removed at a certain costs. Some investments can be characterised as physical assets specificity while others are dedicated assets.

Special equipment was bought that can be used for maintenance of landscape elements in wildlife and landscape production contracts: small mowers for grass (8 farmers); chain saw/tree pruner (6 farmers); nest protecting material (5 farmers); and fencing material (4 farmers). The level of the investment ranges from about € 100 to about € 700. Adaptation of existing machinery

is observed less often (6 of 32 farmers). Adaptations mentioned were investments in existing fertiliser spreaders, field sprayers and game protection equipment on mowers. These investments range in the degree of asset specificity. Generally, the investments in physical assets and dedicated assets are not large and their degree of specificity is low.

The investments in human capital analysed in this chapter take the form of an increase in knowledge using several sources. Twenty-two out of 32 farmers mentioned that their knowledge increased after having signed a contract. Learning by doing was the most important source, in terms of the number of farmers, of increased knowledge mentioned by al the farmers with respect to meadow birds, plants, and other animals. Learning by doing can only occur when farmers take a large share of the work in wildlife and landscape management transactions. Twenty-four farmers out of 32 replied that they perform tasks for wildlife and landscape management. These tasks range from meadow bird protection to maintenance of landscape elements. The majority of the tasks was performed by the farm family. On average these farm families worked 26 hours per year (22 farmers, st. dev. 27). Only three farmers replied that paid personnel was used for these tasks. Finally, 9 farmers had volunteer help for several tasks. The most important task of volunteers was marking nests.

Alternative sources of knowledge with respect to meadow birds were the volunteers and professional journals (about 60% of the farmers). Courses and personal contacts were relatively less important. With respect to knowledge about plant species professional journals, volunteers and courses were relatively important (between about 30% and 50% of farmers surveyed). Only a few farmers mention that their knowledge about mammals, amphibians, and reptiles increased. Learning by doing and professional journals were equally important with respect to knowledge about government regulation (about 75%).

The attributes of the parcels are important with respect to the usefulness for both dairy farming and wildlife and landscape management. The main soil type of the farms in the sample is peat land or peat land in combination with clay. About 80% of farmers had parcels located at more that 1 km from their farm and a large number had parcels with water disposal problems (Table 5.8). Fewer farmers (circa 20%) had parcels in river basins, not suited for dairy cattle and located near to wildlife and landscape areas. When we look at parcels used for wildlife and landscape management many farmers use parcels located more than 1 km away (circa 60%), difficult to access (circa 30%), having an irregular form (circa 35%) or much relief (circa 30%).

However, where attributes are relevant for farmers' parcels used for wildlife and landscape management, the percentage of parcels fitting these attributes is much higher than the percentage of parcels in total: the average scores are in all cases higher for the parcels used for wildlife and landscape management. This means that parcels used for wildlife and landscape management have a high percentage of attributes representing that the land less attractive for a way of farming without wildlife and landscape management. The scores for irregular form and relief do not differ significantly (Wilcoxon signed-ranks tests, not different at a 1% level).

*Table 5.8: Scores for site attributes for parcels (n=29, standard deviation between brackets), 1999**

	Parcels in general		Parcels used wildlife and landscape	
	Number of farmers	Average score	Number of farmers	Average score
Located in wildlife and landscape management area	18	2.1 (1.4)		
Located on more that 1 km distance of the farm	23	2.3 (1.3)	17	4.1 (1.5)
Difficult to access on paved roads	13	2.5 (1.9)	9	4.0 (1.7)
Located in river basins	5	1.4 (0.9)	4	3.5 (1.9)
Not suited for dairy cattle	9	2.4 (1.6)	9	3.6 (1.8)
Located near to nature conservation area	8	1.9 (1.4)	8	4.5 (1.4)
Irregular form	18	2.3 (1.4)	10	2.8 (1.7)
Much relief	13	1.5 (0.7)	9	1.8 (1.5)
Ditch water level is relatively high	24	2.6 (1.6)		
Water disposal is problematic	17	2.3 (1.5)		
Parcels are surrounded by other wildlife and landscape management parcels			15	2.8 (1.4)

Source: Questionnaire data

** The attributes are ranked in 5 equal groups from 0-20% to 80-100% of the parcels. The number of farmers refers to farmers who have a positive ranking*

Because direct measurement was not possible within this project the farmers were asked for their opinion on the results of wildlife and landscape management. Obviously it is important to realise that strategic answers are possible. On the other hand alternative measurement is almost impossible without large scale and costly approaches. The first aspect is the nutrient content of

the soil. About 40 per cent of the farmers in the sample said that the nutrient level decreased. About 60 per cent the farmers said that the nutrient level did not change. For plant species, about 80 per cent of the farmers thought that the number of plant species increased or remained the same. From this group, half thinks that the number of plants increased. For meadow birds, 25 per cent said that the number of birds increased after the contract was concluded. About one third did not know or said that the number of meadow birds decreased. The remaining farmers think that the number of birds remained the same. The farmers judge the results of wildlife and landscape management positively. It should be kept in mind that the factor time was not taken into account.

Property rights

With regard to property rights, farmers in the sample have no doubt about ownership of wildlife and landscape. Property rights or changes in property rights are not perceived as a major source of uncertainty for transactions. Farmers replied that they are the only persons who have something to say about wildlife and landscape on their farm. Income from wildlife and landscape management is not considered contingent on decisions of their neighbours. They also did not consider their decisions to have been forced by others. Further they have the opinion that wildlife and landscape management fits within their farming objectives and this issue was easy to determine. Finally, a large majority of the farmers in the sample (90%) expects that they can use the parcels now under contract for farming in a conventional way after the contract ends because they expect to have the right to do so. These expectations illustrate farmers' opinions concerning the ownership of property rights. It needs to be said that these questions are not comparable to any kind of measurement, but are attitude questions. However, the message resulting from these questions is clear: farmers have the opinion that they possess a large share of the property rights. Further, non-farmers have not been asked for their opinions on these issues, so it was not possible to analyse a potential conflict of interests and consequences.

Uncertainty and risk

From the survey it follows that farmers do not perceive the compensation for wildlife and landscape as having a large impact on their total farm income risk. In Table 5.9 the sources of risk and average scores are given for the farms in the survey. The number of observations used for calculations differs among the sources because farmers had the option to mark "not known" for every source of risk.

*Table 5.9: Ranked potential effects of sources of risk on total farm income risk and income from wildlife and landscape management, 1999**

Source	Total farm income	Income from wildlife and landscape management
Milk-price	4.5 (1.2)	2.6 (1.8)
Environmental regulation	3.6 (1.2)	3.1 (1.6)
Price inputs	3.5 (1.0)	2.2 (1.4)
Production technology	2.9 (1.3)	
Animal welfare regulation	2.7 (1.2)	
Financial compensation wildlife and landscape management	1.8 (1.0)	
Regulation of wildlife and landscape management	2.2 (1.3)	3.0 (1.6)
Non-agricultural developments in area where farm is located	2.4 (1.4)	2.3 (1.2)
Development in official wildlife and landscape areas in neighbourhood of farm	2.8 (1.3)	
Existing situation for wildlife and landscape in area of farm		3.4 (1.4)
Policies of nature conservation organisations		2.9 (1.7)
Management on farms in neighbourhood		1.7 (1.0)
Environmental co-operatives		2.3 (1.4)

Source: Questionnaire data

** The number of observations ranges between 26 and 31 because of the number of farmers who mention "I do not know". The average scores on a 5-Likert scale ranging from no effect at all to a large effect are given (standard deviation between brackets)*

Compared to other sources of income risk, the consequences of changing prices and regulation of wildlife and landscape management are perceived small. As can be expected for dairy farms the perceived risk of changes in milk-prices on the total farm income was rated highest because milk production is the main activity (average ranking of 4.5). Changes in the prices of inputs and environmental regulation are perceived as more important sources of income risk.

Focussing on the income from wildlife and landscape management it can be observed that farmers feel a great effect following changes in the existing situation of wildlife and landscape in their working area (average ranking of 3.4, Table 5.9, column 2) and changes in the regulation of wildlife and landscape (average ranking 3.0). Less important sources are changes in the price of inputs, changes in the management of farmers in the neighbourhood, non-agricultural developments in the area and changes within environmental co-operatives. The rankings of sources of risk differ between the total income and the income from wildlife and landscape management. Changes in regulation of wildlife and landscape is perceived as more important for the income from wildlife and landscape compared to the total farm income (average ranking of 3.0 for income from wildlife and landscape management compared to 2.2 for total farm income, Table 5.9).

Table 5.10 concerns strategies for coping with income risks. A number of strategies were listed, but the focus is on wildlife and landscape management compared to alternative strategies.

*Table 5.10: Possible effects of strategies for coping with total farm income risk, (n=30, standard deviation between brackets), 1999**

Strategy	Possible effect	I do not know
Producing against lowest cost	3.3 (1.1)	1
Working off farm	2.9 (1.5)	2
Long-term contracts with fixed prices	2.3 (1.4)	2
Building up financial reserves	2.2 (1.1)	5
Investing outside agriculture	2.1 (1.2)	11
Wildlife and landscape management	2.1 (1.0)	1
Producing other agricultural products	1.8 (1.0)	3
Producing regional products	1.8 (0.9)	4
Producing recreational products	1.4 (0.8)	3
Other	2.8 (2.1)	28

Source: Questionnaire data

** The average scores of 5-Likert scale are given, ranging from no effect to very great effect*

Looking at the average possible effect in Table 5.10, producing at lowest cost is considered a much more successful strategy for coping with income risk at the farm level than wildlife and landscape management (Wilcoxon signed-ranks test, they are positively different at a 1% level). Wildlife and landscape management is not seen as a successful strategy for coping with income risk at all. Producing at lowest cost as a relevant strategy is comparable to other studies (Meuwissen, 2000: 28 and Patrick et al. 2000: 3). Investing outside agriculture, maintaining financial reserves, and fixed-price contracts for delivering products are considered as equal relevant compared to managing wildlife and landscape. Diversification to another farming type, producing regional products and offering recreational services were perceived as less important among farmers concluding contracts for wildlife and landscape management. Changes in financial compensation for wildlife and landscape management is not considered an important source of income risk at the farm level. This can be explained by to relatively small share of the wildlife and landscape compensation in total income for a large number of farmers.

Transaction costs: information and labour

The majority of the farmers collected information needed for concluding contracts (about 60% of the farners in the sample). A majority of the farmers had no major problems finding information. Further, these farmers did not rank information as extremely complex or very clear. Finally, information was also not ranked as very relevant or very irrelevant. For the majority of the farmers in the sample - depending on the type of management - knowledge increased. Collecting information is just one aspect of the transaction costs involved in wildlife and landscape management.

Table 5.11: Transaction costs before concluding a contract (n=25, standard deviation between brackets), 1999

	Average time involved (hours)	Number of farmers
Collecting information about possibilities within region	1.8 (2.8)	14
Analysis possibilities regulation government	1.9 (3.0)	8
Analysis of opportunity costs	1.0 (2.1)	9
Negotiations/conversation	2.2 (1.8)	18
Finalisation contract	2.1 (1.6)	23
Total transaction costs	7.7 (8.6)	25

Source: Questionnaire data

From Table 5.11 it can be concluded from the average time involved before concluding a contract that transaction costs are relevant to wildlife and landscape transactions. When external labour is needed the costs could rise considerably. After a contract is concluded contracts remain substantial. Table 5.12 gives an overview of the transaction costs after the contract has been concluded.

Table 5.12: Yearly transaction costs after the contract is concluded (n=25, standard deviation between brackets), 1999

	Average time involved (hours)	Number of farmers
Administrative tasks		
• of results	0.8 (2.0)	10
• of labour input	1.2 (4.5)	6
Consultation	0.5 (1.1)	6
Total	2.5 (6.8)	11

Source: Questionnaire data

The most often mentioned task was administration of results (10 farmers, table 5.12). However, this task did not take much time. Excluded from this category is time spent on labour input like demarcating nests and maintenance. The farm family is mainly responsible for the administrative tasks.

Other results of the survey concern counting numbers of species and administrative tasks. About 50% of the farmers acquired information by counting numbers per species and kind of species (16 farmers). Counting the number of birds is relevant for monitoring and presenting results. Of the farmers who counted the numbers of species, the farmer him(her) self did work (more than 75%), sometimes in combination with volunteers or paid personnel. Of the 13 who count plants, 75% counts 3 times per year or less. Birds are counted more often. Seven of nine farmers who count birds count 3 times per year or more. About 60% of the farmers who count birds or plants also count the number of plants or birds per species. Other animals are often not counted (only 1 positive observation). For wildlife and landscape production contracts counting means an increase of transaction costs compared to management contracts.

5.7 Summary and conclusions

This chapter focuses on institutional arrangements for wildlife and landscape management in which individual farmers are involved. The results of a Tobit model show that farm characteristics were important for the probability of contract conclusion and for the amount of wildlife and landscape management. Especially farm characteristics related to present or earlier site-specific investments determine the probability of concluding contracts for wildlife and landscape management. External production circumstances (water drainage and the portion of non-farmland) played an important role. If farm characteristics are well adapted for wildlife and landscape, less specific investments are needed to manage wildlife and landscape. The number of contracts and the revenue per contract increase in time due to changing attitudes of farmers and more opportunities for contracting. There were no differences between the regions. The empirical analysis provides a number of quantitative results. They should be handled with care, because estimations were not very stable.

After a contract has been concluded the characteristics of a transaction and contractual arrangement can be analysed. A survey among individual farmers was developed concerning wildlife and landscape management. Elements of this survey were the number of arrangements, the complexity of an arrangement, property rights and transaction costs. Most farmers had only one relation with a contracting party (governmental agency, environmental co-operative, nature

conservation organisation, etc.). The majority of the farmers were involved in more than one transaction type at the same time (preservation, development, maintenance, products delivered). These transaction types were concluded with one of the three contracting parties distinguished in this chapter. Different transaction types within one institutional arrangement make these arrangements complex. Using institutional arrangements of a more or less similar institutional design make the contracts differ in the degree of completeness, depending on the transaction at stake. More incompleteness results in an increased exposure to opportunism.

Physical specific investments were used, although they were not large or specific. This result is comparable to the results of the Tobit model. Human asset specificity in form of learning-by-doing was important for most farmers. Compared to the Tobit model, the survey allowed directing the measurement more towards the relevance of human asset specificity. Parcels used for wildlife and landscape management had a relatively high percentage of attributes representing attractiveness for wildlife and landscape management. Sources of knowledge were the help of volunteers and professional journals. The involvement of volunteers as an extra party to the contractual arrangement increases the complexity. Farmers had the opinion that they owned a large share of the property rights with respect to land. Wildlife and landscape management was not considered an important source of risk for total farm income. It was also not considered an important strategy for coping with income risks on a farm. Wildlife and landscape management was not an important factor for reducing income risk at farm level. From the survey results that counting species is a time-consuming task, depending on the species counted.

Chapter 6

The Role of Transaction Costs and Bargaining Power in Wildlife and Landscape Management[1]

6.1 Introduction

There is a growing literature on the management of wildlife and landscape[2] (e.g. postponing the mowing of grass to protect brooding meadow birds) by farmers. The literature focuses on the decision whether or not to manage (Brotherton, 1989; Crabtree et al., 1998; Wenum and Wossink, 2001), characteristics of producers and non-producers (Morris and Potter, 1995; Beedell and Rehman, 2000) and the role of transaction costs in this decision (Dorward, 1999; Falconer and Whitby, 1999; Falconer, 2000). Literature is also dealing with farmers co-operating in the management of wildlife and landscape. MacFarlane (1998: 594) argues for linking farmers' land together to create localised, but meaningful, "conservation estates" where management practices are coherent across cadastral boundaries. Hodge (2001: 108-109) concludes that there is scope for the creation of new organisations taking common management decisions. Falconer (1999a: 9; 2000: 391) mentions the idea of farmer networks and environmental co-operatives respectively to save on transaction costs when managing wildlife and landscape collectively.

Lacking in the literature are empirical farm models analysing the combined and linked decisions of individual farmers whether or not to manage wildlife and landscape, how much to produce and whether or not to co-operate. Moreover, the literature has concentrated on the role of (ecological) scale advantages and transaction costs reduction as the main arguments to co-operate

[1] This chapter is written in co-operation with Jack Peerlings.

[2] In real world situations farmers sign contracts with government or nature organisations in which they agree to follow certain actions that improve wildlife and landscape. Throughout this paper we will assume that this production is continuous, which is given the large range of type of contracts not a very restrictive assumption.

paying no attention to the possible bargaining power (countervailing power) of e.g. environmental co-operatives.

Objective of this paper is to develop a theoretical and empirical model for analysing the decisions of individual farmers whether or not to manage wildlife and landscape, how much of these services to produce and to co-operate in order to reduce transaction costs and build up bargaining power. The model is applied to Dutch dairy farmers as the main users of agricultural land in the Netherlands.

To reach the objective a micro-econometric model for Dutch dairy farming, which includes the management of wildlife and landscape, is specified and estimated. The model is then applied to a small group of farms to analyse whether or not and to what extent they will manage wildlife and landscape in case of: (1) no co-operation; (2) co-operation where co-operation reduces transaction costs and (3) co-operation where co-operation reduces transaction costs and leads to a higher price for wildlife and landscape management because of an improved bargaining position compared to individual supply.

Section 6.2 describes the theoretical model. Section 6.3 discusses the empirical model, data and estimation. Simulations and results are given in section 6.4. Section 6.5 summarises the main results and provides some conclusions.

6.2 Theoretical Model

In this section a theoretical micro-economic model for wildlife and landscape management is developed. This model includes individual decisions whether or not to manage wildlife and landscape and to co-operate by means of an intermediary organisation which we will denote as an environmental co-operative.

Model of wildlife and landscape management

Here a micro-economic model of wildlife and landscape management in dairy farming is presented. It is assumed that dairy farming is characterised by joint production of multiple outputs. Given the milk quota system it is assumed that milk production is fixed in the short run. Moreover, management of wildlife and landscape is assumed fixed in the short run because contracts, which determine the level op management, have to be concluded for a period of five years in the Netherlands. Inputs are assumed variable or fixed in the short run (quasi-fixed inputs). It is assumed that farmers maximise profits given the level of prices and quantities of quasi-fixed outputs (milk and wildlife and landscape management) and quasi-fixed inputs. The short term, dual profit function $\pi_h(p,z_h)$ for farmer *h* is given by

$$\pi_h(p,z_h) = \max_y \{p.y_h \mid T(z_h,y_h), p>0\} \qquad \text{h} = 1,\ldots,\text{H} \qquad (1)$$

where π_h profit for farmer h; y_h vector of (variable) netputs for farmer h (if an individual netput $y_{hi} > 0$ it is an output, if $y_{hi} < 0$, it is an input); z_h vector of quasi-fixed netputs for farmer h (if a specific netput $z_{hk} > 0$, it is a quasi-fixed input, whereas if $z_{hk} < 0$, it is a quasi-fixed output), p vector of netput prices, *T* technology set.

It is assumed that the profit function is continuous and twice differentiable. Furthermore, profits are non-negative, non-decreasing in output prices, non-increasing in input prices and convex and linear homogenous in prices. It should be realised that profits do not equal farm income. Farm income equals profits plus revenue from milk and wildlife and landscape management minus the paid costs for fixed inputs (e.g. interest) plus income from outside the farm (which are all assumed fixed here). The supply or demand functions $y_{hi}(p,z_h)$ for netput i of farmer h is given by (Hotellings' lemma):

$$y_{hi}(p,z_h) = \frac{\partial \pi_h(p,z_h)}{\partial p_i} \qquad \text{h} = 1,\ldots,\text{H and } \text{i} = 1,\ldots,\text{I} \qquad (2)$$

The shadow price $s_{hk}(p, z_h)$ of quasi-fixed input or quasi-fixed output k of farmer h is given by:

$$\frac{\partial \pi_h(p, z_h)}{\partial z_{hk}} = s_{hk}(p, z_h) \qquad \text{h} = 1,\ldots,\text{H} \text{ and } \text{k} = 1,\ldots,\text{K} \qquad (3)$$

The shadow price for wildlife and landscape management is equal to the marginal costs of management and differs over individual farms.

The above model shows profit, netputs and shadow prices of dairy farmers managing wildlife and landscape(management can also be zero). Next we investigate what would happen if management of wildlife and landscape is no longer fixed. In other words would the farmer in that case produce these services or not and how many services would be produced?

No co-operation

Suppose farmers are faced with the choice whether or not to manage wildlife and landscape. Management will be positive if profit in case of producing these services is higher than without this management. The optimal level of management will be determined in the point where marginal costs of managing wildlife and landscape equals the price.

We assume that wildlife and landscape management is demanded by the government or nature organisations and that it is either completely price elastic; the price is given (w_1), or depends on the price (demand is price elastic). If demand is price elastic the inverse demand function is given by:

$$w_1(z_1^d) = w_1(\sum_{h=1}^{H} z_{h1}) \qquad (4)$$

where w_1 price (compensation paid) for wildlife and landscape management, z_1^d demand for wildlife and landscape management and z_{h1} management of wildlife and landscape by farmer h.

Wildlife and landscape management contracts involve transaction costs (Falconer and Whitby, 1999: 67; Hanley et al., 1999: 72; Hodge, 1991b: 375). In this paper we only deal with the transaction costs paid by farmers. Examples are the costs of negotiating with the government or nature organisations, administration of the contract, and monitoring and administrating results.

These costs have to be distinguished from the public transaction costs like administrative costs of operating the contract for the government (Falconer, 1999b: 71-73) or the private transaction costs of nature organisations. Private transaction costs for farmers can be separated in fixed and variable costs. Fixed transaction costs depend only on the decision to contract. Examples are the cost of gaining information on possible contracts, administrative tasks, and management decisions like at what price does wildlife and landscape management becomes profitable. Variable transaction costs depend on the level of management and are here assumed to be constant per unit of wildlife and landscape management produced (proportional to management). Examples of variable transaction costs are the costs of auditing, monitoring and reporting species.

The possibility to manage wildlife and landscape results in the following profit maximisation problem on farm level:

$$\pi_h(p, z_h^e, w_1, c_h, C_h) = \max_{z_1} \left\{ g_h(p, z_h^e, z_{h1}) + w_1 z_{h1} - c_h z_{h1} - C_h \right\} \quad \text{h} = 1,\ldots,\text{H} \qquad (5)$$

where

$$g_h(p, z_h^e, z_{h1}) = \max_{y_h} \left\{ p y_h \mid z_h^e, z_{h1}, p \right\} \qquad \text{h} = 1,\ldots,\text{H} \qquad (6)$$

The first order condition is given by

$$\frac{\partial \pi_h(p, z_h^e, w_1, c_h, C_h)}{\partial z_{h1}} = w_1 - c_h + \frac{\partial g_h(p, z_h^e, z_{h1})}{\partial z_{h1}} = 0 \qquad \text{h} = 1,\ldots,\text{H} \qquad (7)$$

where z_h^e quasi-fixed inputs and outputs excluding wildlife and landscape management for farmer h, C_h fixed transaction costs for farmer h (only dependent on the decision to contract), c_h variable transaction costs for farmer h per unit of wildlife and landscape management. $g_h(p, z_h^e, z_{h1})$ is the restricted profit function defined as profits given a certain level of wildlife and landscape management.

In the profit maximising optimum (equation 7) price (w_1) equals marginal costs of producing wildlife and landscape management. Marginal costs consist of the variable transaction

costs per unit of management and the loss in restricted profit if management of wildlife and landscape increases by one unit.

From the first order condition the supply function of wildlife and landscape management can be derived

$$z_{h1} = f(p, w_1, z_h^e, c_h) \qquad \text{h} = 1,\ldots,\text{H} \tag{8}$$

Notice that the level of management is independent of fixed transaction costs.

However wildlife and landscape management is only produced if profit increases. So

$$\pi_h > \pi_h^e \qquad \text{h} = 1,\ldots,\text{H} \tag{9}$$

where π_h^e is profit with no wildlife and landscape management.

Notice that fixed transaction costs do influence profit and therefore the decision whether or not to manage wildlife and landscape.

Co-operation leading to a reduction in transaction costs

Here we assume that farms co-operate in an environmental co-operative in order to reduce (fixed) transaction costs. Although a co-operative leads to extra fixed transaction costs (membership fees for the co-operative, administration of the co-operative and enforcement costs) there can be an overall reduction compared to the situation where farmers sign an individual contract because fixed transaction costs like negotiation costs for a contract, search costs, etc. can be shared. In the model we assume fixed transaction costs for a member of the co-operative to be a downward sloping function of the fixed transaction costs in case of no co-operation and the number of members of the co-operative. This is off course rather arbitrarily but a more general function could be used. The profit maximisation problem for an individual farmer h is equal to the profit maximisation problem in equations (5) and (6) but C_h is now replaced by $C_h^{new} = k_h(C_h, N), \frac{\partial k_h(C_h, N)}{\partial N} < 0$ where N is the number of farms participating in the co-operative. Notice that the first order condition (equation 7) does not change. So the farmer produces the same amount of wildlife and landscape management whether or not he is a member of the co-operative. However, given that fixed transaction costs are now lower it could be the case that more farmers manage wildlife and landscape (equation 9). This result does not depend

on whether the price of wildlife and landscape management is constant or not (equation 4). If the price is variable and more farmers manage wildlife and landscape the price will go down affecting the decision whether or not to join the co-operative and the amount of wildlife and landscape managed. So price, management level and the decision to join the co-operative or not are mutually dependent.

Co-operation leading to bargaining power

Besides a reduction in fixed transaction costs a co-operative could provide bargaining power (countervailing power). When there is one co-operative that co-operative is unlikely to take the price of wildlife and landscape management as given. The co-operative will recognise its influence over the price, and chooses that level of price and output that maximises overall profits of its members. In other words the co-operative will act like a monopolist. For the government or nature organisations it is attractive to deal with the co-operative instead of a group of individual farmers because dealing with a single party leads to a reduction in (public) transaction costs. So, the co-operative maximises total profit of its members not only deciding on what amount to produce but also taken into account the effect of management on price. Moreover, also the number of participants is variable affecting management, price and profit. Substituting the inverse demand function in equation 5 and summing over all members of the co-operative H[3] leads to the following profit maximisation problem for the co-operative:

$$\pi = \max_{z_{11},\ldots,z_{H1}} \left\{ \sum_{h=1}^{H} g_h(p, z_h^e, z_{h1}) + w_1\left(\sum_{h=1}^{H} z_{h1}\right) \times \sum_{h=1}^{H} z_{h1} - \sum_{h=1}^{H} c_h z_{h1} - \sum_{h=1}^{H} C_h \right\} \qquad (10)$$

[3] We use the symbol H here to indicate all members of the co-operative. We do not know this number in advance. Empirically we calculate profits of the co-operative for all possible number of members, the optimal number is where profit of the co-operative is largest.

The first order conditions are given by:

$$\frac{\partial \pi}{\partial z_{h1}} = \frac{\partial w_1\left(\sum_{h=1}^{H} z_{h1}\right)}{\partial z_{h1}} \times \sum_{h=1}^{H} z_{h1} + w_1\left(\sum_{h=1}^{H} z_{h1}\right) - c_h + \frac{\partial g_h(p, z_h^e, z_{h1})}{\partial z_{h1}} = 0 \qquad h = 1,\ldots,H \quad (11)$$

Rearranging gives:

$$w_1 = -\frac{\partial w_1\left(\sum_{h=1}^{H} z_{h1}\right)}{\partial z_{h1}} \times \sum_{h=1}^{H} z_{h1} + c_h - \frac{\partial g_h(p, z_h^e, z_{h1})}{\partial z_{h1}} = 0 \qquad h = 1,\ldots,H \quad (12)$$

where $w_1(\sum_{h=1}^{N} z_{h1})$ inverse demand function.

Equation 12 shows that all farmers joining the co-operative have the same marginal costs. Further rewriting gives (see e.g. Varian, 1992: 234):

$$w_1 = \frac{c_h - \frac{\partial g_h(p, z_h)}{\partial z_{h1}}}{1 - \frac{1}{|\varepsilon^d|}} \qquad h = 1,\ldots,H \quad (13)$$

Equation (13) indicates that the price is a mark-up over marginal costs (the nominator is equal for the members of the co-operative), where the mark-up depends on the elasticity of demand of wildlife and landscape management by the government and nature organisations. In case of a monopoly farmers achieve an extra profit compared to the case in which they only co-operate to reduce fixed transaction costs. When $|\varepsilon^d|$ goes to infinity the mark-up goes to zero and the price will be equal to the price in the situation of no bargaining power. Farmers face a flat demand curve (infinitely elastic demand). For $|\varepsilon^d| < 1$ marginal revenue is negative, so it can not possibly equal marginal costs. We assume extra profit (rent) is divided over the members of the co-operative using the share in total wildlife and landscape management. Again we assume that

farmers only enter the co-operative if profit is larger than in case of no wildlife and landscape management (see equation 9). Important to note is that individual farmers could increase profit by producing more (see Varian, 1992: 304). However, we assume that the government or nature organisations do not want to deal with individual farmers (because of high transaction costs) which effectively will prevent this over-production.

6.3 Empirical model

In this section the shadow price equations for wildlife and landscape management of individual farms in a representative sample of Dutch dairy farming are determined using a micro econometric profit model (empirical version of the theoretical model described by equations 1-3). The inverse shadow price equations are then used to derive optimal supply of wildlife and landscape management. Micro econometric profit models have been applied frequently in the agricultural economics literature (see Shumway, 1995, for an overview). This also holds for the dairy sector in The Netherlands (Boots et al, 1997; Helming et al, 1993). Models of Dutch dairy farming have to take into account that individual dairy farms have operated under a supply quota since 1984.

Dairy farming is modelled assuming that farms produce three outputs; milk (z_{h0}), which is subject to a supply constraint, wildlife and landscape (z_{h1}), which is also subject to a supply constraint (long term contracts), and a composite of other outputs (e.g. beef) (q_{h1}). Three variable inputs are assumed; purchased feed (q_{h2}), dairy cattle (q_{h3}) and a composite of other inputs (q_{h4}). Furthermore, four quasi-fixed inputs are distinguished; labour (z_{h2}), land (z_{h3}), buildings (z_{h4}), and machinery (z_{h5}). The model also includes a time trend (z_{h6}) representing technology.

The symmetric normalised quadratic (SNQ) form is used as the empirical specification (Kohli, 1993; Oude Lansink and Stefanou, 1997) of the restricted profit function (see equation 1). The SNQ is a flexible functional form that allows for negative profits and for curvature conditions (convexity in prices) to be imposed globally. Another advantage is that the estimation

results do not depend on the choice of a numeraire netput (as is the case for the also frequently used normalised quadratic). The SNQ profit function (for all farmers h) takes the following form:

$$\pi_{ht}(v_{it}, z_{kht}) = \sum_{i=1}^{4} \alpha_{ih} v_{it} + \tfrac{1}{2} w^{-1} \sum_{i=1}^{4} \sum_{j=1}^{4} \alpha_{ij} v_{it} v_{jt} + \sum_{i=1}^{4} \sum_{k=0}^{6} \gamma_{ik} v_{it} z_{kht} + \tfrac{1}{2} w \sum_{k=0}^{6} \sum_{n=0}^{6} \beta_{kn} z_{kht} z_{nht} \qquad (14)$$

where $\pi_{ht}(v_{it}, z_{kht})$ profit of farmer h in year t, v_{it} price of netput i in year t, z_{kht} quasi-fixed input or quasi-fixed output k of farmer h in year t. Symmetry is maintained by requiring $\alpha_{ij}=\alpha_{ji}$ and $\beta_{kn}=\beta_{nk}$. Linear homogeneity in prices is imposed by the term $w = \sum_{l=1}^{4} \theta_l v_{lt}$, where θ_l are non-negative constants determined as the average shares of netput l (l=1,..,4) in total costs plus revenues. Additional restrictions $\sum_{j=1}^{4} \alpha_{ij} = 0 \quad (\forall i = 1,..,4)$ have to be imposed, in order to identify all parameters α_{ij}.

Netput equations (i=1,..,4 and for all farmers h: see (3)) are derived using Hotelling's lemma

$$q_{iht} = \alpha_{ih} + w^{-1} \sum_{j=1}^{4} \alpha_{ij} v_{jt} - \tfrac{1}{2} \theta_i w^{-2} \sum_{l=1}^{4} \sum_{j=1}^{4} \alpha_{lj} v_{li} v_{jt} + \sum_{k=0}^{6} \gamma_{ik} z_{kht} + \tfrac{1}{2} \theta_i \sum_{k=0}^{6} \sum_{n=0}^{6} \beta_{kn} z_{kht} z_{nht} \qquad (15)$$

Shadow price equations (k=0,..,6 and for all farmers h: see (3)) are derived taking the first order derivative of the profit function with respect to the quantities of fixed outputs and inputs:

$$s_{kht} = \sum_{i=1}^{4} \gamma_{ik} v_{it} + w \sum_{n=0}^{6} \beta_{kn} z_{nht} \qquad (16)$$

Notice that shadow prices between farms only depend on differences in the level of quasi-fixed inputs. Assuming the management of wildlife and nature variable the supply function can be derived by taking the inverse of the shadow price equation (14) and replacing the shadow price by the market price (w_1). The supply function of wildlife and landscape management is given by:

$$z_{1ht} = \frac{-\sum_{i=1}^{4} \gamma_{i1} v_{it} - \sum_{n=0,2}^{6} \beta_{1n} z_{nht} + w_1}{w \beta_{11}} \qquad \text{h} = 1,\ldots,\text{H} \qquad (17)$$

The market price is either constant or is determined by equating demand and supply. In the simulations we assume a constant elasticity demand curve, hence $|\varepsilon^d|$ is constant.

Data and Estimation

Data on specialised dairy farms covering the period 1986/87 - 1999/00 come from a stratified sample of farms keeping accounts on behalf of the Dutch Agricultural Economics Research Institute (LEI) farm accounting system. The stratification is based on economic farm size, age of the farmer, region, and type of farming. Annual data of participating farms are available. The data set used for estimation contains 6203 observations on 1237 farms. In the sample (very) small farms and non-specialised farms are not represented. Data is used from Dutch dairy farms that have more than 50 per cent of their Dutch standard gross margin from dairy farming[4]. The farms usually remain in the panel for about five years, so the data set forms an incomplete (or unbalanced) panel[5]. Data for the average farm in 1999/00 are given in Table A.1 in the Appendix.

If prices at the farm level are available in the FADN, they are used to calculate price indices[6]. If prices are not present in the FADN, price indices are borrowed from CBS/LEI-DLO (2000). In this study we used implicit quantity indices. Implicit quantity indices are obtained as the ratio of value to price index and therefore quantities are in prices of a specific year, 1991 is the base year. The price index used in this study is the average of the multilateral Törnqvist price index over the farms for every year. This price index varies over the years but not over the farms, implying that differences in the composition of a netput with respect to quality are reflected in the quantity (cf. Reinhard, 1999: 25).

In the model two supply-constrained outputs, one unconstrained output, three variable inputs and five quasi-fixed inputs are distinguished. The first constrained output is milk (milk quota).The second constrained output is wildlife and landscape management. The variable wildlife and landscape management is based on the decrease in production of grass expressed in kilo fodder unit milk per hectare (kFUM) (energy content of fodder). The price used in the

[4] See CBS/LEI Landbouwcijfers 2000 for norms on gross margins for different products

[5] The authors thank Stijn Reinhard for providing the methods for aggregating data.

[6] Prices in the paper are given in euros. However, the research was done in guilders.

simulations is based on the financial compensation for wildlife and landscape management. The compensation is based on (Heinen, 1997: 3):

- the decrease in production of grass expressed in kilo fodder unit milk per hectare (kFUM) (energy content of fodder) ;
- the increase in labour input in hours per hectare;
- the change in operating costs (e.g. lower fertiliser expenditures) is deducted.

The production of grass differs under different contracts because of prescriptions set by the government or nature organisations. For example, in The Netherlands there are five contracts for nesting periods possible that differ in the date the nesting period ends: June 1, June 8, June 15, June 22, and June 30. The starting date is the same for all these contracts: April 1. When the nesting period gets longer the decrease in kFUM will be larger and more wildlife and landscape management. The financial compensation per kFUM can change every year, also for contracts that were concluded in previous years.

The unconstrained other output is an aggregate of revenues from marketable crops, beef and veal, pigs, poultry and other farm revenues. The three variable inputs are purchased feed for cattle, dairy cattle and other input. Purchased feed contains purchased concentrate and roughage. The price index of dairy cattle is calculated as the multilateral Törnqvist price index of the revaluation of the dairy livestock. The revaluation of the livestock equals the difference in value of livestock at the start-balance and end-balance of each year. The other input is a composite of feed for animals other that dairy cattle, seeds, fertilisers, pesticides, contract work, veterinary services, fuel, energy, other cattle and other variable inputs.

Quasi-fixed inputs are labour, land, buildings, and machinery. Labour consists of total family labour measured in hours. Land is measured as the total area of farmland in hectares. A Törnqvist price index is used to aggregate the price indices of the components of capital stock. The characteristics of the data are summarised in Table A.1.

Using data from a non-representative survey under Dutch dairy farmers (30 farmers) we assume fixed transaction costs to be € 175 and the variable transaction costs 4% of the compensation paid to farmers. Fixed transaction costs were measured as labour costs (hours times wage level of workers in agriculture) of concluding a contract with the government. Elements are costs for gathering information about wildlife and landscape management contracts,

costs of analysing opportunities and negotiation costs. The variable costs were measured as labour costs of monitoring and administrative tasks (e.g. reporting to the government or nature organisations). Falconer (2000: 388) reports similar results.

The system of equations (15) is estimated with additive error terms included prior to estimation. Every farm is assumed to have a farm-specific intercept, reflecting differences in farm characteristics (e.g. management quality and soil quality). A fixed-effects model explicitly accounts for this assumption. The necessary transformation for such a model can also be applied to an incomplete panel, like our data set (see Thijssen, 1992). The profit function is not estimated along with the netput equations, since the intercepts of the netput equations appear as slope coefficients in the profit function. Including the profit function during estimation requires direct estimation of all farm-specific intercepts. Note that all parameters of the profit function and shadowprice equations are identified in the netput equations.

Error terms may be correlated across equations. Therefore, the estimation technique used is SUR (Johnston and Dinardo, 1997, 318-320). The covariance matrix of residuals used in estimating the system is corrected for the difference in the number of observations (Judge et al., 1988, p.462). The estimation results can be found in Table A.2 in the Appendix and show that about half of the parameters are significantly different from zero at the 5 per cent significance level.

6.4 Simulations and results

Supply equation wildlife and landscape management

Table A.3 in the Appendix presents the supply equation of wildlife and landscape management (equation 17). Supply of wildlife and landscape is increasing in price (w_1). The coefficients of the netput prices are negative. So other output is a substitute for wildlife and landscape management. Higher feed prices make the management of wildlife and landscape less attractive because a higher production of these services leads to less roughage production on the farm and more purchased feed demand. Supply of wildlife and landscape management is negatively related to the milk quota level, so an increase in milk production leads to a decrease in supply. The

estimates for land, labour, and machinery imply that larger amounts of these quasi-fixed inputs on the farm result in higher supply of wildlife and landscape management. Larger amounts of buildings result in a lower supply of wildlife and landscape. One could conclude that the main inputs for wildlife and landscape management are land and labour.

Simulations

In the base simulation individual farmers decide whether or not to manage wildlife and landscape given that the price of the services is fixed. Farmers manage wildlife and landscape only if profit increases (equation 9). Farmers supply services till the point where marginal costs equal the price the government or nature organisations offer. The price is assumed to be €0,30 for every farm. Moreover, we assume fixed and variable transaction costs equal among farmers. So the base simulation represents the situation where wildlife and landscape management is variable. The simulation is performed using equations 9, and 17 and an equation to calculate profit. Profits are calculated as the value of variable outputs minus inputs plus the revenue form wildlife and landscape management minus transaction costs. Because these equations are mutually dependent a search algorithm (in GAMS) was used to solve the set of equations.

In the first simulation farms co-operate in order to reduce fixed transaction costs. It is expected that this leads to more farms producing wildlife and landscape management. However, the price, and therefore marginal costs, does not change which implies that the level of management of farms already managing wildlife and landscape in the base run does not change. We assume fixed transaction costs for an individual farmer to be equal to his initial fixed transaction costs divided by the number of farmers participating in the co-operative.

The second simulation is identical to the first except that in this simulation we no longer assume perfectly price elastic demand but a downward sloping constant elasticity (assuming that the price elasticity of demand equals 4) of demand function for wildlife and landscape management.

The third simulation is identical to the second simulation but farms co-operate not only to reduce fixed transaction costs but also to achieve bargaining power (see equation 13).

During the simulations input and output prices are held constant. This seems realistic because wildlife and landscape management is relatively small compared to milk production.

Farms are selected for an area where farmers actually manage wildlife and landscape. In the model, the effects are determined for 12 individual farms in the sample for the year 1999/00 all located in the areas Krimpenerwaard, Alblasserwaard, and Vijfherenlanden in the province of South-Holland in The Netherlands. Given the regional differences environmental co-operatives act regionally therefore we did not take the representative sample for the Netherlands, although we used this sample to estimate the model.

The simulations describe the effects on management of wildlife and landscape, farm profits, the number of farms managing wildlife and landscape and transaction costs.

Results

In a situation where farmers can share fixed transaction costs (simulation 1) 1 extra farmer will manage wildlife and landscape (see Table 6.1). Wildlife and landscape management increases with 23% which is only due to the management by the extra farmer. Profit for all farmers managing wildlife and landscape increases due to the reduction of transaction costs for farmers participating in the environmental co-operative.

Table 6.1: Wildlife and landscape management under different scenarios for 12 individual farms, located in the areas Krimpenerwaard, Alblasserwaard, and Vijfherenlanden, 1999/00. Results of the scenarios compared to the base run.

		Co-operation		
	Base run: no co-operation	Simulation 1: Base run plus reduction fixed transaction costs	Simulation 2: simulation 1 plus elastic demand	Simulation 3: simulation 2 plus bargaining power
Wildlife and landscape management (€ 1000)	1.7	+23%	+9%	-19%
Price wildlife and landscape management (€)	0.30	0	-2%	+5%
Number of farmers managing wildlife and landscape	2	3	3	3
Transaction cost per unit of wildlife and landscape management (€ 1000)	0.052	-24%	-22%	-16%

Source: own calculations

In the second simulation the government has an elastic demand for wildlife and landscape management and neither farmers nor government have market power. Under this simulation price, wildlife and landscape management and number of participating farmers are lower compared to a situation with a fixed price but higher than in the base run. A reduction in transaction costs leads to extra farmers participating and therefore to extra management. This increase in management leads to a lower price, and therefore, less management which partly offsets the management increase caused by the reduction in fixed transaction costs.

In the third simulation the environmental co-operative has monopoly power. In case of monopoly farmers are able to set a mark-up above their marginal costs. In case of a monopoly farmers produce less wildlife and landscape management compared to the other simulations. However, profit is higher. The price is higher than the price in the base run. The results in this simulation depend on the assumption that the government or nature organisations only do business with the environmental co-operative in a specific area and not with individual farmers. At the given market price two farmers extra would like to manage wildlife and landscape and

join the co-operative but they cannot because that would reduce profit for the members of the co-operative.

Sensitivity analysis

This section contains two sensitivity analyses. First, the outcomes of the base run are determined for two alternative levels of fixed transaction costs: 20% lower transaction costs and 20% higher transaction costs. Second, the outcomes of the base run are determined for two alternative prices of wildlife and landscape management: 20% lower prices and 20% higher prices. The results of both sensitivity analyses are given in Table 6.2.

*Table 6.2: Effect of different levels of fixed transaction costs and prices of wildlife and landscape management on production and profit**

	Production wildlife and landscape management (€ 1000)					Profit (€ 1000)				
		Transaction cost		Prices			Transaction costs		Prices	
Farm number	Base run	-20%	+20%	-20%	+20%	Base run	-20%	+20%	-20%	+20%
1					0.53	197.8				197.9
2					0.87	66.1				66.5
3	0.84	0.84	0.84		1.63	257.1	257.1	257.1		258.7
4	0.91	0.91	0.91		1.70	140.3	140.3	140.3		142.0
5						85.7				
6						26.5				
7					1.20	121.6				122.7
8						25.2				
9						75.9				
10						107.7				
11					0.51	76.7				76.7
12					0.84	129.8				130.1

Source: own calculations

** For production only positive values are given and for profit only values different from the base run*

Lower (higher) fixed transaction costs make it more (less) attractive for individual farmers to manage wildlife and landscape. With 20% lower fixed transaction costs or with 20% higher transactions costs still 2 farmers manage wildlife and landscape. Forming an environmental co-operative to share fixed transaction costs is more (less) attractive with high (low) transaction

costs. Notice that the level of fixed transaction costs does not influence the production level but does influence profits.

Lower (higher) prices result in fewer (more) farmers managing wildlife and landscape and lower production per farmer. There are two reasons for this. First, with lower (higher) prices less (more) farmers can earn back the fixed transaction costs resulting in less (more) farmers joining the co-operative. Second individual farmers produce more (less) wildlife and landscape management at higher (lower) prices. Farm profits increase with higher prices and decrease with lower prices.

6.5 Summary and conclusions

Objective of this paper is to develop a theoretical and empirical model for analysing the decisions of individual farmers whether or not to manage wildlife and landscape, how much of these services to produce in a situation with and without co-operation from other farmers. The motivations for co-operation analysed are: (1) reduction of transaction costs and (2) building up of bargaining power. The model is applied to Dutch dairy farmers as the main users of agricultural land in the Netherlands.

The reduction of fixed transaction costs makes it attractive for farmers to form an environmental co-operative in case of a fixed price for wildlife and landscape management. Therefore more wildlife and landscape management is produced. However price - and therefore marginal costs - do not change, so if a farmer already produced wildlife and landscape management before the co-operative existed, his production does not change, but his profit does. If demand is no longer perfectly elastic (price is endogenous) an increase in wildlife and landscape management leads to lower prices offsetting part of the wildlife and landscape management and profit increase caused by lower fixed transaction costs. However, if the environmental co-operative acts as a monopolist, an improved bargaining position leads to a decrease in the management of wildlife and landscape and higher prices, but also to a smaller number of farmers producing wildlife and landscape management. This situation could still be socially optimal, compared to a situation without the co-operative, because of a potential reduction in public transaction costs or transaction costs of nature organisations. The latter result

shows the importance of the entrance policy of the co-operative: who can become a member and under which conditions?

Results of our study are obviously subject to some qualifications. First, the model is a short-term model. Changes in technology, for example, are not accounted for. Moreover, welfare analysis is not possible because the model does not contain consumer benefits and transaction costs of the demanders of wildlife and landscape management. Extending the model in this direction could be worthwhile in future research. Notwithstanding these qualifications the model presented is a powerful tool for the study of wildlife and landscape management and the motives for forming environmental co-operatives.

Appendix

Table A.1: Data for average specialised dairy farm in the Netherlands in 1999/00

Variable	Unit	Average	Standard deviation
Output:			
• Milk	1000 '99 Euro	162	98
• Wildlife and landscape	1000 '99 Euro	1	2
• Other output	1000 '99 Euro	41	57
• Variable input:			
• Feed input	1000 '99 Euro	36	30
• Cattle input	1000 '99 Euro	3	3
• Other	1000 '99 Euro	35	25
Quasi fixed inputs:			
• Labour	hours	4242	1609
• Land	ha	41	23
• Capital buildings	1000 '99 Euro	204	121
• Capital machinery	1000 '99 Euro	87	60

Source: FADN

Table A.2: Estimation results

Parameter	Estimate	t-ratio	parameter	estimate	t-ratio
γ_{10}	-0.2003	8.70	α_{22}	9.1895	2.61
γ_{11}	-0.6195	-1.07	α_{23}	-0.3603	0.00
γ_{12}	8.0099	5.33	α_{33}	24.8803	0.00
γ_{13}	1.2708	6.42	β_{00}	-0.0001	-1.36
γ_{14}	0.0680	6.51	β_{01}	0.0003	-0.17
γ_{15}	0.0966	4.26	β_{02}	0.0035	1.10
γ_{16}	1.0741	2.64	β_{03}	0.0006	1.85
γ_{20}	-0.2208	-18.29	β_{04}	-0.001	-3.44
γ_{21}	-0.7135	-2.12	β_{05}	0.0003	6.17
γ_{22}	-0.5852	-0.70	β_{06}	0.0037	3.23
γ_{23}	0.5789	5.51	β_{11}	-0.0085	-0.29
γ_{24}	-0.0219	-3.79	β_{12}	0.2133	1.36
γ_{25}	-0.0105	-0.84	β_{13}	0.0195	1.27
γ_{26}	1.3815	5.94	β_{14}	-0.0012	-1.10
γ_{30}	-0.0117	-21.17	β_{15}	0.0037	1.26
γ_{31}	-0.0480	-2.63	β_{16}	-0.0646	-1.23
γ_{32}	0.0222	0.53	β_{22}	-1.7309	-4.69
γ_{33}	-0.0322	-6.52	β_{23}	0.02155	0.73
γ_{34}	-0.0007	-2.48	β_{24}	0.0067	3.63
γ_{35}	-0.0004	-0.58	β_{25}	-0.0037	-0.96
γ_{36}	0.0529	4.90	β_{26}	-0.0124	-0.14
γ_{40}	-0.0419	-5.88	β_{33}	0.0056	1.69
γ_{41}	-0.3837	-1.85	β_{34}	0.0005	2.11
γ_{42}	4.0726	8.10	β_{35}	-0.0015	-4.37
γ_{43}	-0.9008	-14.47	β_{36}	-0.0165	-1.61
γ_{44}	-0.0021	-0.60	β_{44}	0.00003	2.03
γ_{45}	-0.0223	-2.94	β_{45}	-0.0002	-5.96
γ_{46}	-0.3920	-2.52	β_{46}	0.0011	1.46
α_{11}	0.0487	0.01	β_{55}	0.0001	1.50
α_{12}	-0.6087	-0.20	β_{56}	-0.0024	-1.48
α_{13}	0.4379	2.61	β_{66}	-0.0384	-0.80
Observations	6203				
Farms	1237				
Period	1986/87-1999/00				

Table A.3 presents the supply equation of wildlife and landscape management (equation 17). Notice that this equation is not directly estimated but the coefficients are from the estimated netput equations.

Table A.3: Supply equation wildlife and landscape management for dairy farms in the Netherlands

	w_1	v_1	v_2	v_3	v_4	z_0	z_2	z_3	z_4	z_5	z_6
Supply	2844	-1762	-2029	-136	-1091	-0.82	532	20	-3	6	-40

Source: own calculations

PART III ENVIRONMENTAL CO-OPERATIVES MANAGING WILDLIFE AND LANDSCAPE

Chapter 7

Environmental co-operatives: a new institutional arrangement for farmers

7.1 Introduction

Environmental co-operatives are a relatively new phenomenon in Dutch agriculture. Slangen (1993; 1994) analysed the possibility of groups of farmers (clubs) managing wildlife and landscape. His studies had an economics background and were theoretically oriented. Others, like those of Corporaal (2000) and Oerlemans et al. (2001) were more practically oriented and focused on the activities and problems of environmental co-operatives. Other studies in the Netherlands were more or less case-studies, e.g. Hees et al. (1994); Renting, et al. (1994); Driessen et al. (1995: 94-108); and Selnes (1999). These studies have a sociological, public administration and/or public policy background.

Also outside the Netherlands the (potential) role of groups of farmers managing wildlife and landscape has been recognised. Hodge (1991a: 191-193; 1991b: 382) analysed the possible role of groups of people in managing of wildlife and landscape. The collective interests of these groups are more related to the public interest than those of private owners individually. While some elements of the countryside do approach the qualities of pure public good, such as in the case with its existence value, other elements are closer to private goods. In the case of the provision of countryside goods like wildlife, landscape or amenity, the problem of collective provision is that the good being produced cannot be restricted to the members of a 'club' (Dwyer and Hodge, 1996: 36). Hence the critical question is whether it is possible to exclude people from benefiting from something once it has been provided. The majority of the Conservation, Amenity and Recreation Trusts (CARTS) discussed by Dwyer and Hodge (1996: 42-43) do not conform to the club "model". Compared to these CARTS, environmental co-operatives can have an extra dimension in the sense that they contract with individual farmers for the provision of goods and

services. These contracts have many private-goods characteristics and non-members can easily be excluded from the possibility of being contracted by the club. Falconer (cf. 1999a: 9; 2000: 392) suggests that farmer networking could be important to the overall running costs of a scheme. Hodge (2001: 108) states that conditions should be established by which groups of landholders can agree to adopt a co-ordinated approach to resource management. In Australia, farmers organise themselves in Landcare group networks (cf. Sobels et al. 2001:266). Activities of these groups take place on private and public land and include meetings, field days and farm walks, property and catchment planning; applications for government funding; and conducting on-ground works such as tree planting, pest-animal and weed control and fencing to manage stock access to remnant vegetation and waterways, etc. (Sobels et al. 2001: 266).

This chapter contributes to the literature by making theoretically and empirically the first analysis of the diversity of environmental co-operatives as institutional arrangements in the Netherlands. Further, this study's approach differs from existing studies because of its focus on institutional aspects of groups of farmers managing wildlife and landscape. A more general description of environmental co-operatives, i.e. their number, geographical distribution, relevance for agricultural land use, activities, and problems, is important for gaining insight into the relevance of this phenomenon. This implies that it is necessary to describe environmental co-operatives and to answer the first basic question as to what environmental co-operatives are. The second question to be analysed in this chapter is why these co-operative arrangements originated in the Netherlands. To answer this question a number of explanations for the founding of organisations in general and an environmental co-operative in particular are discussed from a New Institutional Economics point of view in Section 7.2. The environmental co-operatives as "club" arrangement and the role of the institutional environment will be discussed in Chapter 8. These explanations together with the question of what are environmental co-operatives will be analysed empirically in Section 7.3. This chapter ends with a summary and conclusions.

7.2 Explanations for collective action among farmers

An environmental co-operative acts as an intermediary between a service contractor (e.g. the government) and individual farmers (service providers). An intermediary is an economic agent that purchases from suppliers for resale to buyers or that helps buyers and sellers meet and transact (cf. Spulber, 1996: 135). Several explanations are possible for the development of environmental co-operatives from an institutional economics point of view. The following reasons for the development of environmental co-operatives are analysed in this chapter:

1. savings on transaction costs ;
2. a way of coping with market failure;
3. preventing of "hold-up" problems;
4. building countervailing power;
5. an alternative to government intervention.

These explanations will be discussed from an institutional economics point of view in the remaining section.

The first reason is the reduction transaction costs for the parties to an arrangement. The alternative situation would be that farmers conclude contracts for wildlife and landscape management on an individual basis. According to transaction cost theory, there are three critical dimensions involved in a transaction, which are important for the level of the transaction cost: asset specificity, uncertainty, and frequency (see Chapter 3). The first and most influential dimension is asset specificity, which has been already discussed in Chapter 3. The second dimension (uncertainty) relates to the assumption of human agents being subject to bounded rationality. Uncertainty reveals itself in the assumption of bounded rationality. Uncertainty is evident in wildlife and landscape management, e.g. in the population dynamics of grassland birds, in weather conditions, etc. The third dimension, frequency, involves the repetition of the same transaction. It is much easier to learn about prices, quality of products, etc. if there are a large number of people in the market and a large number of exchanges are take place.

Transaction costs are high when an exchange depends on a specific person, location or physical assets. In these conditions, the ability to bargain is low and the chances for opportunism are high. Rules or institutional arrangements like environmental co-operatives, which also make

the activities of others more predictable, can reduce transaction costs. Asset specificity and uncertainty for wildlife and landscape management depend on the kind of transaction and range from low to high. Frequency of transactions in an environmental co-operative is low because the transactions are occasional. An organised form of co-operation in the form of an environmental co-operative can reduce the transaction costs of supplying the impure public goods wildlife and landscape.

The second explanation for institutional arrangements such as environmental co-operatives is based on the problems of non-rivalry and non-excludability. Both are reasons for market failure. Typical for wildlife and landscape are non-rivalry and to some extent non-excludability because of incomplete delineation of property rights. An environmental co-operative as institutional arrangement can reduce the cost of delineating the property rights and help extract some income from the asset. Moreover, market failure creates an incentive for producers to react collectively. Farmers need an institutional arrangement as a supporting structure for co-ordination and motivation. The increase in the income potential of an asset has another effect/incentive on the behaviour of its owners. It increases the aggregate gains from co-operation among them, which in return is expected to lead to better delineation of the asset (Barzel, 1997: 95).

A third explanation for the emergence of environmental co-operatives as an institutional arrangement is that individual farmers need an institutional arrangement to countervail opportunistic behaviour and hold-up problems in their relation with public and private contractors for wildlife and landscape management. The core of the hold-up problem consists of asset specificity together with incomplete contracting. Asset specificity refers to the degree to which an asset is committed to a specific task, and thus can not be redeployed to alternative uses without sacrificing the greater part of its value. Williamson (1996: 59-60) distinguishes between six types of asset specificity. For environmental co-operatives the following three types are relevant:

1. Site specificity, which refers to an asset that becomes committed to a particular use owing to its location. The land used for preserving wildlife and landscape, because of its 'use' but also because of its 'site', is asset-specific. Valuable areas for wildlife and landscape are immobile and local (i.e. tied to a particular area).

2. Physical asset specificity, such as an investment in machinery, equipment or land, and having a narrowly defined purpose; investments in land or in machines only used for wildlife and landscape management have a narrowly defined purpose, and are sunk investments.
3. Human asset specificity that arises through learning-by-doing. Preserving wildlife and landscape is a process of learning-by-doing; it requires an investment in human capital and time.

The hold-up problem arises in the situation where each contracting party worries about being forced to accept disadvantageous terms later, after it has sunk an investment, or worries that its investment may be devalued by the actions of others. The party that is forced to accept a worsening of the effective terms of the relationship once it has sunk an investment has been 'held-up' (Milgrom and Roberts, 1992: 136).

A fourth explanation is that an institutional arrangement can be used for developing countervailing power with respect to public and private contractors. If farmers pay more attention to wildlife and landscape they will sacrifice gains, on the one hand, from the specialisation in more regular or prevailing agriculture. On the other hand, the attribute wildlife and landscape is an impure public good or common good. It lies, according to Barzel (1997: 5), in the 'public domain'. However, the (opportunity) cost for the farmer to produce wildlife and landscape is a private cost and the benefits of the attribute wildlife and landscape is an impure public good. This means that the property rights are different and vaguely defined, which leads to conflicts over residual claims and decision control.

The fifth reason explaining the foundation of environmental co-operatives is also connected with market failure. Traditionally, market failure forms an argument for government intervention. Even if there is a justification for government intervention, an analysis of this interference is necessary. Such analysis casts light on the functioning of the government itself; after all the government can also fail (for an overview of non-market failure, see e.g. Wolf, 1993).

7.3 Environmental co-operatives in the Netherlands

This section deals with the results of the mail survey[1]. In the Netherlands, the total number of environmental co-operatives encountered was circa 80 in 1999. These organisations had about 6600 farmer-members. The total area in use by the members of environmental co-operatives was circa 134 thousand ha in 1999. The size and regional distribution of co-operatives of environmental co-operatives in the Netherlands in given Table 7.1.

Table 7.1: Regional distribution of environmental co-operatives in the Netherlands (n=41), 1999[2]

Province	Area in use (*1000 ha)	Area in use in % of total agricultural area	Number of co-operatives	Number of farmer-members	Members in % of total number of farms
Drenthe	4	2	2	70	1
Friesland	23	8	16	590	8
Flevoland	.	.	.	.	.
Gelderland	4	1	12	330	2
Groningen	7	4	6	200	1
Limburg	15	11	6	3030[3]	40
Noord-Holland	27	15	12	530	6
Noord-Brabant	.	.	.	.	.
Overijssel	.	.	2	130	1
Utrecht	17	19	10	590	13
Zeeland	3	1	4	70	1
Zuid-Holland	34	18	12	1060	9
Total	134	7	81	6600	6

Source: Questionnaire data and LEI/CBS, 2000

The provinces Noord-Holland, Zuid-Holland and Friesland counted for more than 60% of the total area wildlife and landscape management in the Netherlands. The most important provinces for the environmental co-operatives in the Netherlands were Friesland, Noord- and Zuid-Holland (and Gelderland). However, with respect to the number of members, Limburg seemed to be very important, followed by Zuid-Holland. The figure for Limburg was biased because all the

[1] The survey itself is discussed Chapter 4.

[2] No questionnaires were returned from Flevoland and Noord-Brabant.

[3] This figure can be biased because it depends on an outlier for an area where every farmer automatically a member.

members of the farmers-organisation in that area are also members of one co-operative. On average, 7% of the total agricultural area was in use by environmental co-operatives. With regard to the land use, environmental co-operatives were most important for provinces in the western part of the Netherlands (Noord-Holland and Zuid-Holland). The participation of farmers is largest in Limburg and Zuid-Holland. Table 7.2 gives an overview of land-use, size and corresponding numbers of environmental co-operatives aggregated in the Netherlands.

Table 7.2: Size characteristics for environmental co-operatives (n=41), 1999

Category of land	Land-use (*1000 ha)	Land-use in % of land-use agricultural sector	Number of co-operatives	Average land-use of co-operatives (ha)
Grassland	109	11	58	1901
Maize land	5	2	36	143
Arable land	16	2	15	1041
Non-agricultural land	2	.	13	137
Rest land	2	.	8	297
Total	134	7	81	1654

Source: Questionnaire data

The largest part of the land in use by the co-operatives was grassland, followed by arable land. On 11% of the total area of grassland in the Netherlands, co-operatives are active, whereas on arable land environmental co-operatives were not that important. The average size per co-operative was also large for grassland[4]. The total average size of environmental co-operatives was about 1600 ha. The data from the survey showed that in regions where co-operatives are located, on average of 50% of the area is in use by members of the environmental co-operative.

About 10 percent of grassland used by farmers who are members of an environmental co-operative was contracted under the 'Regulation Management Agreement and Nature Development'[5]. About 75% of the environmental co-operatives contracted individual farmers. These contracts ranged from maintaining hedges and farmland margin management to tolerating meadow birds and combinations all kinds of activities. This means that the co-operative served as a principal, concluding contracts with individual farmers. If farmers were receiving financial

[4] The averages are calculated per category of land.

[5] Mininsterie van Landbouw, Natuurbeheer en Visserij (1996) Regeling Beheersovereenkomsten en Natuurontwikkeling, Den Haag.

compensation for these contracts, funding also originated from resources other than the 'Regulation Management Agreement and Nature Development'. This could be the environmental co-operative itself (earning by selling products or from membership fees), the local government or other organisations (like the EU). In the latter cases the environmental co-operatives function as an intermediary. It is remarkable to observe the extent of non-agricultural areas – having no official status as agricultural land – used by co-operatives. This shows that not all the co-operatives restrict their attention to agricultural areas exclusively. Table 7.3 gives an overview of activities of environmental co-operatives for 1999.

Table 7.3: Main activities of environmental co-operatives (n=40), 1999

Activities	Number of co-operatives	
	Taking place	In development
1. Wildlife and landscape management on own land	29	5
2. Recreational products	13	10
3. Decrease negative environmental externalities	13	4
4. Wildlife and landscape management for others	12	8
5. Regional products	8	11
6. Water management	4	14

Source: Questionnaire data

The most frequent activity is wildlife and landscape management on the farmers' own land, followed by recreational products, decreasing external environmental effects and wildlife and landscape management for others. Programs relating to water cleaning or water buffering are less important, although many organisations were making plans in that direction. Organisations carrying out rather more activities were on average older than those with one or no activities. About 60 percent of the organisations in our sample was involved in wildlife- and landscape management on their own land. They value this activity also as the most important activity in their daily business. The 'organisations' believe that enthusiasm for the activities and objectives also plays an important role in the decision to become a member.

In 1999, the average age of environmental co-operatives in the Netherlands was 3 years. About 30% of the organisations were older than 3 years and about 20% were founded in 1998. This means that the phenomenon of environmental co-operatives was then relatively new for the Netherlands. Due to this short period of existence, many organisations and activities were still

developing. Table 7.4 gives an overview of the difficulties environmental co-operatives have to cope with.

Table 7.4: Difficulties in organising activities in an environmental co-operative, ordered from the most frequently to the less frequently mentioned (n = 39), 1999

Difficulty:	Percentage of organisations
1. Delays in getting financial support	69
2. Government regulations need changing	46
3. Not enough time available to develop activities from ideas	44
4. No co-operation from non-agricultural organisations in working area	31
5. No difficulties	15
6. No support from members/participants	5
7. Other problems	3

Source: Questionnaire data

Many environmental co-operatives saw financing as one of most severe obstacles to developing ideas into activities like wildlife and landscape management contracting. Other bottlenecks were the lack of available time to develop ideas, and government regulations. Table 7.5 gives an overview of the most important funding sources. There was a difference in financial sources for organisational activities like monitoring and meetings, and production activities like preserving wildlife and landscape. Remarkable is that the environmental co-operatives were dependent on local governments for a major part of there financial resources. The non-response to this question can be partly explained by the following reasons: (1) the organisations did not have a clear picture yet; (2) they were not able to distinguish between different sources; or (3) their funding sources were mainly project-related and therefore they had no overview for the whole environmental co-operative.

Table 7.5: Financial sources of co-operatives for different activities, 1999 (percentage)

	Organisational activities (n= 26)	Production activities (n=21)
Members	40	5
Non-government	7	6
Central government	16	36
Local government	24	43
Activities	13	10

Source: Questionnaire data

Founding an environmental co-operative

Reasons for starting an environmental co-operative are given in Table 7.6. The reasons are ordered according to their ranking and Likert scores (see Churchill, 1999: 392-395). In the questionnaire, farmers were asked to rate reasons on a 5-point Likert scale where 1 is very important and 5 is totally unimportant. The reasons were mentioned in the questionnaire in non-systematic order. For each reason the rank was calculated - ranging from 1 to 12 - per co-operative, depending on the average Likert-score for that reason given by a co-operative. The mean ranks were calculated as follows (cf. Siegel, 1956: 166-173):

$$R_j = \frac{\sum_{i=1}^{I} r_{ji}}{I}$$

where R_j = rank total for reason j

r_{ji} = rank of reason j of co-operative i

I = total number of environmental co-operatives

The mean ranks indicate the order of importance for the different reasons. To analyse the answers of the answers on attitude questions non-parametric statistics were used. The analysis was applied to the relations within the whole set of alternatives. The null hypothesis is that the alternatives listed for a specific question are chosen equally. Friedman's two-way analysis of variance by ranks is used to decide whether to accept or reject the null hypothesis under a 5% level of significance (Siegel, 1956). The number of alternatives and clubs were large enough to apply these tests. For every club, the alternatives were ranked from 1 to k. Then a mean rank was calculated for every alternative. In the case that every alternative is equally distributed, the mean

ranks will be equal. The Friedman test determines whether the ranks of the alternatives differ significantly. The test statistic is distributed approximately as a χ^2-distribution.

*Table 7.6: Importance of reasons for starting an environmental co-operative, measured on a 5-Likert scale where 1 is very important and 5 is totally unimportant, ordered from most important to most unimportant (n=36), 1999**

Reason:	Mean	Std. dev.	Mean Rank
1. Contribution to the management of wildlife and landscape	1.9	1.1	4.06
2. Reaction to whishes of society	1.9	0.8	4.26
3. Being an interest group	2.1	1.2	4.93
4. To generate extra income by managing wildlife and landscape	2.3	1.1	5.40
5. Restrictions on farming opportunities resulting from the development of wildlife and landscape management areas	2.3	1.3	5.44
6. Co-operation with fellow citizens	2.4	1.1	6.01
7. To improve co-operation among farmers	2.5	1.0	6.32
8. Knowledge transfer between farmers	2.6	1.0	6.64
9. Restrictions on farming opportunities resulting from environmental regulation	2.9	1.3	7.25
10. To generate extra income through the production of new products (like regional products)	3.7	1.2	9.10
11. To generate extra income by offering recreational services on the farm	3.7	1.0	9.29
12. Restrictions on farming opportunities caused by urbanisation	3.9	1.5	9.29

**Medians for alternatives differ significantly at a 1 percent level,Friedman test (Siegel, 1956:166-173), χ^2= 120,601,*
Source: Questionnaire data

The responses of the environmental co-operatives - given in Table 7.6 - are used as indicators for the relevance of the explanations for founding environmental co-operatives. The questionnaire contained an "other reasons" response to offer the co-operatives an opportunity to list reasons that were not presented in the questionnaire. However, the "other reasons" responses did not give an indication that the list of reasons mentioned in the questionnaire could be improved.

The most important reason for starting a co-operative is to contribute to wildlife and landscape management. This answer could be biased by the fact environmental co-operatives might think that they should find this important (respondents are subject to strategic behaviour). However, also the second response in ranking indicates an argument for starting a co-operative that is not directly related to income, and this answer should be less sensitive to strategic behaviour. Being a pressure group is seen as important for the foundation of the co-operative.

Generating income and coping with restrictions resulting from the development of wildlife and landscape management areas are the fourth and fifth reason for environmental co-operatives. This means that compared to other reasons, generating income was not the most important. However, in comparing the medians for the first five reasons it appeared that they do not differ. This means that the importance of the first five reasons do not differ at a 5% significance level (Friedman's two-way analysis of variance by ranks, significant at a level of 17.3% or lower). Further, developments in urban areas are not seen as an important reason for founding an environmental co-operative.

Table 7.7 lists the five different explanations discussed in Section 7.2 and reasons from Table 7.6 that are used for the measurement of explanations. The contribution to the management of wildlife and landscape, reacting to societal wishes, and the generation of extra income are proxy variables for aspects of supply and demand and therefore related to markets and market failures. Co-operation is interpreted as a way to prevent the government from threatening to hold-up the rent by going to another farmer. Being an interest-group is a proxy for countervailing power because it represents the idea of having more power collectively. Co-operation with fellow citizens can reduce transaction costs. Knowledge transfer means that the farmers do not have to search for information individually; and it is therefore thought to reduce transaction costs. Co-operation in order to cope with restrictions resulting from wildlife and landscape management areas can thought of as an alternative to government intervention.

The criteria for judging whether reasons are recognised by an individual environmental co-operative as important was a Likert score of 2 or lower. This means that on average a reason is considered rather important or very important. When several reasons were aggregated into one new reason the following criterion was used: the aggregated reason was recognised as one of the elements of was recognised. The remaining reasons in Table 7.6 cannot be aggregated.

Table 7.7: Explanation, measurement and percentage of organisations recognising reasons for founding environmental co-operative (n=36), 1999

Explanation	Related to reasons in Table 7.6	Recognition of explanation (%)
1. A way of coping with market failure	1,2,4	92
2. Preventing of "hold-up" problems	7	53
3. Building countervailing power	3	67
4. Savings on transaction costs	6,8	70
5. An alternative to government intervention	5	64

Source: questionnaire data

Coping with market failures is an important reason for founding an environmental co-operative for a large majority of the environmental co-operatives. Building up countervailing power, savings on transaction costs and an alternative to government intervention was recognised by a majority of the organisations. Preventing hold-up problems was perceived as a reason for founding a club by half of the environmental co-operatives. It is important to realise that measurement of these reasons is difficult and recognition of a reason by an environmental co-operative does not imply that they successfully perform the task suggested by the reason.

7.4 Summary and conclusions

In this chapter a general description of environmental co-operatives cites the number co-operatives, their geographical distribution, relevance for agricultural land use, activities and problems. In 1999 about 80 environmental co-operatives had about 6600 farmer member/participants and 1600 non-farmer member/participants. On average 6% of the total agricultural area is in use by environmental co-operatives. The average size of a single co-operative was about 1600 ha. Most co-operatives were active in Northern and Western Netherlands. In regions where a co-operative is located, about 50% of farmers were members of an environmental co-operative. About 75% of the environmental co-operatives concluded contracts with individual farmers. These contracts ranged from maintaining hedges and farmland margin management, to tolerating meadow birds or geese. The main activities of an environmental co-operative are producing impure public goods like wildlife and landscape. Important services were consultation with others on behalf of the members, and working as a

pressure group. Lack of financial resources, governmental regulation and available time were the main problems of the co-operatives.

Five main explanations for the development of environmental co-operatives are discussed from an institutional economics point of view. The explanations are that they are a way to: (1) cope with market failure; (2) save on transaction costs; (3) build up countervailing power; (4) provide an alternative to government intervention; and (5) prevent hold-up problems. From the survey it follows that these explanations are recognised as reasons for founding environmental co-operatives. Ranked in order of importance, elements of these explanations were: contributing to wildlife and landscape management, reacting to societal wishes, being an interest group, generating income from wildlife and landscape, and restrictions on farming opportunities following the development of wildlife and landscape management areas.

Chapter 8

The institutional arrangement of environmental co-operatives

8.1 Introduction

This chapter deals with the influence of the institutional environment on the institutional arrangement of environmental co-operatives, which means that the institutional arrangement will be discussed in more detail. The chapter focuses on the characteristics of environmental co-operatives and not on contractual arrangements for producing goods or services in which individual farmers are involved. The analysis addresses the following two aspects of the institutional environment influencing environmental co-operatives:

- general legislation on organisation forms;
- changes in the informal institutional environment (expressing the wish of society).

The basic issue in this chapter is whether evidence can be found for a relation between the institutional environment and individual environmental co-operatives. The first question is how the institutional environment in the Netherlands restricts or encourages environmental co-operatives in their choice of a design for their institutional arrangement. This leads in the first place to a discussion of the influence of the general rules in the Netherlands concerning juridical forms of organisations on environmental co-operatives. In the second place, the perceived influence by farmers of the norms in a society is analysed.

In Section 8.2, relationships between the institutional environment and environmental co-operatives are analysed: what is the role of general laws on organisations, and what (if any) is the influence exercised by the wishes of society? The second question in this chapter is how the institutional arrangement of environmental co-operatives can be characterised. This question focuses on the issue of whether the institutional arrangement can be characterised as a club

arrangement, and this is analysed in Section 8.3. In Section 8.4 the results are presented of a survey related to the two research questions discussed in this chapter. Section 8.5 gives a summary and conclusions.

8.2 The institutional environment as determining factor for institutional arrangements

Over the past decades, economists have given increasing attention to the role of institutions in the operation of economic systems. Individuals, including the members of an environmental co-operative, are subject to restrictions resulting from both institutional arrangements and the institutional environment. Individuals also influence the institutional environment through for instance the electoral process (cf. Williamson, 1994: 323). The institutions relevant to environmental co-operative members consist of external and internal institutions (institutional arrangement). In this section the focus is on the external institutional environment.

Law and the judiciary are reflected in constraints that originate in the institutional environment (cf. Williamson, 1996: 327). From New Institutional Economics it follows that without regulation of the ways to become a legal entity, farmers would change their organisation form because legal restrictions would no longer be relevant to the objective of reducing transaction costs. The juridical form of the organisation has consequences for the relationships within the organisation. Environmental co-operatives are not free in the choice of a certain organisational form. In order to be a legal entity, farmers have to follow general rules and procedures prescribed by Dutch law. This means that the formal institutional environment restricts or encourages farmers in their choice of an institutional arrangement.

Informal institutions are the second building blocks of the institutional environment. For analysing changes in the informal institutional environment the reference level is used as an indicator of the existing informal institutional environment. Hanley et al. (1998:103) define the reference level of the environment as the level of the quality of the environment the society finds it should be. According to Hanneman (1999:75) people have relative rather than absolute preferences for items, and they judge a situation not in terms of absolute levels of attributes but, rather in relation to some *reference level.* This can be the *status quo,* the pre-existing level of the item, or it can be a *norm* or an *expectation* regarding the item's level. When a new factory, which

pollutes soil, water and air, is established, the *reference level* is the situation before there was pollution, before there was a factory. In practice, the determination of a clear *reference level* is often controversial (Slangen, 2001: 27-28). Different polluters have different opinions about the reference level in a society compared to consumers.

Bromley and Hodge (1990: 208-209) have a somewhat different view of the *reference level.* They connect the *reference level* with the allocation of the individual property rights of the farmers, i.e. the allocation of the power these rights confer, between them and the government. This allocation can change with time. How do changes in the allocation of property rights come about? An important influence on the changes is the shifting of people's preferences. Shifting preferences lead to change in the *optimal level* of environmental quality. This means that with shifting preference the *reference level* also changes. The status quo property rights arrangements that have served agriculture so well, exist for historical reasons and may not necessarily be appropriate for the future. Shifting values and changing perceptions of the role of agriculture will surely bring about at least marginal shifts in property rights and policy entitlement (Bromley and Hodge, 1990: 212).

Under the influence of changes in the institutional environment the meaning of the protection of property rights is shifting. Farmers may say: it is my land, and therefore I have the property rights. Non-farmers may say: it is our environment. Because of the environment or environmental goods, public goods are taking an increasingly larger part of the agricultural land (including the amenities) and are becoming part of the public domain (cf. Barzel 1997: 5). This has consequences for the specification and protection of property rights, and with that the right, for the compensation of farmers. It should be stressed that for common goods, there are no individual rights, only common rights. For the survey the term "wishes from society" is used because "reference level" as a proxy variable was more difficult to operationalise.

8.3 The club as institutional arrangement

As already argued in Chapter 3, the design of hybrid institutional arrangements involving groups of individuals deserves attention. Central within this thesis is the club arrangement. A club is a voluntary group of individuals who derive mutual benefits from sharing one or more of the following: production costs of activities and services, the members' characteristics (e.g., members have land, are farmers), or a good characterised by excludable benefits (Cornes and Sandler, 1996: 347). When production costs are shared and the good is purely private, the institutional arrangement is a private good club. The internal institutions consist of institutional arrangements (including norms and values) among the members of the environmental co-operative. Internal institutions evolve from human experience and incorporate solutions that have tended to serve people best in the past. Examples are customs and good manners. Violations of internal institutions are normally sanctioned informally (Kasper and Streit, 1998: 31). When clubs grow, there are increasing problems of internal information and informal control. Organisation costs rise as more formal institutions have to be implemented (Kasper and Streit, 1998: 182). Some of the internal institutions are unique for a environmental co-operative, others deviate from institutions outside the environmental co-operative or within other environmental co-operatives.

A difference between the governance of a hierarchical organisation and an institutional arrangement of a club is that the authority within a club is not allocated from the top down, but from the bottom up (cf. Brink et al., 1999: 3). The members of clubs constitute the highest authority; they delegate power to other levels within the organisation. In this respect, there are two ingredients to a constitution of a club (co-operative): (1) the allocation of control rights, or votes; and (2) the allocation of income rights, or shares (cf. Hart and Moore, 1998: 37). Under outside ownership (a firm) the outsider holds all shares and votes. In a profit-oriented club, votes are allocated across the membership; and in a non-profit club, the allocation of shares is irrelevant. The control rights are important for a club because - for a given size of club - the members will have to agree about how to produce jointly.

Environmental co-operatives are not only a supporting structure for facilitating transactions, but also organisations consisting of contractual relationships. The members of an environmental co-operative mostly maintain the power of control (ownership) over their assets,

such as land and other marketable goods. In these cases the farmers have the residual control rights: the owner of the asset has the right to decide all uses of the asset in any way not inconsistent with a prior contract, custom or law. However, the autonomy of the property rights is only partial because wildlife and landscape are partly common property. The property rights can not be delineated completely. Because of these partial rights the residual rights control rights are not completely in the hand of the farmers. So they are not the only owners and therefore do not have complete power of control over the wildlife and landscape.

The advantage of the club as institutional arrangement compared to other institutional arrangements is assumed to be caused by the internal institutions (institutional arrangement) of the club. Applying the transaction cost theory, it follows that at any moment in time there is a finite set of institutional opportunities and organisational forms that are efficient in a certain institutional environment. In analogy to Coase's argument for the firm, a club is formed if the transaction costs of obtaining services inside the club are larger than the corresponding transaction costs outside the club (cf. Ruys et al., 2000: 425). A number of elements of such a club arrangement deserve attention: voluntarily membership; sharing of (club) good; existence of non-members; exclusion mechanism; dual decision; and optimality. These points are discussed in more detail:

- First, members choose to belong voluntarily a club arrangement, because they anticipate a net benefit from membership. The utility or expected income jointly derived from membership and from the use of other goods must exceed the utility associated with non-membership status. Furthermore, the net gain in utility or expected income from membership exceeds or equals membership fees or toll payments (Cornes and Sandler, 1996: 347).
- Second, clubs involve sharing the use of an impure public good, the use of the service of the club, and sharing in the benefits. Sharing often leads to a partial rivalry of benefits as more and more members crowd one another, detracting from the quality of the service received. Crowding and congestion imply that one user's utilisation of the club good, decreases the benefit or quality of service still available to the remaining users. As such, crowding or congestion depends on the measure of utilisation, which could include the number of the members, the total number of the members who use the club's facilities, or the number of visitors to

the areas or provisions of the club (cf. Cornes and Sandler, 1996: 348). A club can ration use effectively by means of internal institutions as long as the club is small, and when the people meet sufficiently frequently that they can exercise mutual internal controls over property use.

Club congestion may assume diverse forms: long files, long waits, slower and less service, and in the case of wildlife and landscape, lower quality. As membership size grows, both costs and benefits arise: costs involve increased congestion, while benefits result from cost reduction owing to the sharing of the provision expense associated with the club good. The club will expand to the point at which these additional crowding costs just equal the benefits from lower fees (cf. Ricketts, 2002: 398). By adding a cost offset to the benefits derived from expanding the membership size, crowding leads to finite membership. If the facilities of the club are subject to crowding, new members will, beyond a certain point, reduce the service flow experience by the established group.

- A third distinguishing characteristic of a club arrangement is the existence of non-members. For pure public goods, all individuals can be members without crowding taking place, so that non-members do not exist. For club goods, non-members of a given club have two options: They can join another club proving the same good, or they may not join any club offering the club good. If all individuals in the entire population are allocated among a set of clubs with no overlapping or non-assigned individuals, the population is partitioned into a set of clubs. The number of clubs then becomes an important choice variable. When, however, some individuals do not belong to any club supplying the club good, then the population is not partitioned (Cornes and Sandler, 1996: 349).
- A fourth distinguishing feature of club arrangements is the presence of an exclusion mechanism, whereby non-members and/or non-payers can be barred. Without such an exclusion mechanism, there would be no incentives for potential members to join (external free-riding) and for members to pay dues and other fees (internal free-riding). The external free-riding problem is a common-resource problem occurring when property rights are non-tradable, insecure, or unassigned (cf. Cook and Iliopoulos 2000: 336). The internal free-rider problem is common

property problem. This occurs when new members obtain the same patronage and residual rights as existing members and are entitled to the same payment per unit of patronage. This set of equally distributed rights combined with the lack of a market to establish a price for residual claims reflecting accrued and present equivalents of future earning potential creates an intergenerational conflict (Cook and Iliopoulos 2000: 336). This means a disincentive to invest for existing members. The associated cost of operation and provision of an exclusion mechanism must be less than the benefits gained from allocating the shared good within a club arrangement.

- A fifth distinguishing attribute of club arrangements concerns a dual decision. Since exclusion is practised, members with user privileges must be distinguished from non-members. Moreover, the provision quantity of the shared good must be determined. Insofar as the membership decision affects the provision choice, and vice versa, neither can be determined independently. Club membership includes several aspects: number of other members, relevant characteristics of other members, relevant characteristics of a member in question, and institutional arrangements within the club (cf. Ellickson, 1999: 1187). For pure public goods, however, only the provision decision needs to be considered – the membership is the entire population (Cornes and Sandler, 1996: 350).
- A final feature that differentiates club goods from pure public goods concerns optimality. In the case of club goods, members or firms can form clubs that collect tolls through an exclusion mechanism. Under a wide variety of circumstances, these clubs can achieve Pareto-optimal results without resorting to government provision (cf. Cornes and Sandler, 1996: 350). When the club decisions are represented as a co-operative action, the resulting outcome will be a Pareto optimum for the members. As noted earlier, members belong to a club because they perceive a net benefit from membership. This characteristic is not used for further analysis because Pareto efficiency will not be realised with non-rational decision-makers (e.g. Furubotn and Richter, 1997: 457).

The main formal organisational forms following from the formal institutional environment in the Netherlands with bottom-up authority delegation are formal associations, foundations and legal co-operatives. These organisational forms are frequently used in the Netherlands. Formal associations and legal co-operatives have members whereas the foundation has no members in a legal sense. Power in a foundation is with the board of the foundation. A foundation can have a number of people financing the organisation, but they have no control over the organisation. A foundation can be founded by one person which implies that we should not speak of a club at all.

Formal associations and foundations are not allowed to share profits among the members, whereas legal co-operatives are allowed to do this. However, it is difficult to determine profits within legal co-operatives. A formal association is an organisation, whose legal statutes is formalised by a notary. In the articles of formal associations the organisation name, municipality of its location, goals, obligations of members (or the way obligations can be imposed), as well as the way the board will be nominated, are listed. Dutch law requires that associations be founded by more than one person. Control rights in the form of voting are distributed formally in legal co-operatives and legal associations. An important difference between associations and legal co-operatives is the allowance to make profits and to redistribute them among the members, which creates an extra incentive for the legal co-operative and its members in the form of a joint income.

From the characteristics of the three organisational forms it follows that the formal association and legal co-operative come closest to a club arrangement because of voluntary membership, sharing, non-members, exclusion mechanisms, and a dual decision. Although there exist general rules and procedures regarding legal forms, the institutional arrangements are heterogeneous. A foundation differs more from the club because it does not have real members and the users of the facilities of a foundation do not have to be members. The characterisation of environmental co-operatives will be addressed empirically in Section 8.4.

8.4. Club arrangements and the institutional environment of environmental co-operatives

This section deals with the results of the mail survey concerning club arrangements and the role of the institutional environment[1]. Based on the definition and characteristics of clubs arrangements derived in Section 8.2 it is analysed to what extent the environmental co-operatives fit this definition and characteristics. Further, the influence of the institutional environment will be analysed empirically.

The institutional arrangement of environmental co-operatives

In most environmental co-operatives farmers are members voluntarily. In areas with environmental co-operatives, on average about 50% of the farmers are members of a co-operative. This means that non-members are present in such an area. Important activities of environmental co-operatives are concluding contracts with individual farmers and acting as a pressure group. Such activities involve sharing of costs and benefits. Sharing may cause problems if the club shares the costs and the benefits are owned privately. In the case of marketable, regional and recreational products, such a trade-off would be possible.

Non-members can be excluded from the benefits of the club accruing to contracting members. However, it is difficult to exclude non-members from activities like being in a pressure group. Being a pressure group is seen as one of the tasks of environmental co-operatives. The dual decision is important because the provision of contracts to the individual members is dependent on deciding to be a member. No direct evidence was found for congestion in our questionnaire.

Exclusion within co-operatives is often carried out by excluding non-members from concluding wildlife and landscape management contracts with the environmental co-operatives or producing regional products. In the case of a pressure group, exclusion is more difficult. However, it also depends on the objectives of the pressure group. If the co-operative succeeds in decreasing the negative external effects of the production within an area, non-members will benefit from this reduction in the sense that they will have better opportunities in this area.

[1] The survey itself is discussed in chapter 4

The members for a large part finance the organisation and activities, while the most important source for funding the activities are the central, regional and local governments. These funding relations make the relation with the government as a principal more complicated. The organisations also expect the government to fund their activities. Table 8.1 shows the characteristics of the institutional arrangements of environmental co-operatives.

Table 8.1: Institutional arrangements of environmental co-operatives in the Netherlands (in number of organisations/persons)

Organisation type	Number	Farmer-members or participants	Other members or participants	Total area (*1000ha)
Formal association	53	3000	1400	107
Foundation	18	900	200	18
Legal co-operative	4	2700	0	9[2]
Remainder	6	.	.	.
Total	81	6600	1600	134

Source: Questionnaire data

From Table 8.1 it follows that the majority of environmental co-operatives in the Netherlands are formal associations (67%) or foundations (25%). Another, less important, organisational form is the legal co-operative, and some organisations have no legal form. In Section 8.3 it is argued that the formal association and legal co-operative come close to a club arrangement. This leads to the conclusion that the majority of the environmental co-operatives in the Netherlands can be characterised as a club arrangement.

In the Netherlands the approximate total number of farmers participating in organisations of farmers with the objective of conserving wildlife and landscape is about 6600. About 3000 farmers are members of an environmental co-operative organised as a formal association. About 1400 non-farmers participate in formal associations. The remainder category in Table 8.1 consists of co-operatives that have no legal status. Differences between club arrangements have been found for voting rules, membership fees, types of memberships, etc. The allocation of control rights within environmental co-operatives, in the form of a voting system, is organised in several ways. The control rights are not always the same for farmers and non-farmers. Often, the voting right in a formal association is depends on being a farmer or not. In about 50% of the

[2] This is the area in use by the co-operative and not by the members

cases every member has one vote, 40% of the associations have a voting system where every member with a farm has one vote. The boards of environmental co-operatives play an important role in the functioning of the organisation: they often initiate and carry out new activities. The two main institutional arrangements for environmental co-operatives (associations) in the Netherlands implies that the majority of the environmental co-operatives can not be involved in commercial activities. This means that redistributing profits among the members cannot be one of the motives for founding these organisations.

The institutional environment

In the preceding section it is argued that the preferences in a society are a proxy variable for the reference level in a society. Environmental co-operatives were asked for their reasons for founding the co-operative to preserve wildlife and landscape. Wishes from the society were an important factor for founding an environmental co-operative. These wishes from society were not measured directly, but farmers were asked whether wishes from society played a role as a reason for founding their environmental co-operative. They ranked this factor as second most important for founding their organisation. Ranked by importance, income was the fourth most important goal in founding a co-operative. The most important reason for founding an environmental co-operative was that farmers wanted to contribute to wildlife and landscape management. Other important reasons for founding an environmental co-operative were to improve the protection of interests of the farmers and to have an organisation for communicating between the members and for co-operating with non-farmers in an area. It can be expected that there be a difference between the stated goals of the organisation and the goals of the individual farmers. For individual farmers, enthusiasm, income and an organisation that negotiates with the government were important reasons to become a member. Acting as an interest group is also seen as an important task for a co-operative. The reasons for starting an environmental co-operative which are formally stated in the foundation acts, are presented in Table 8.2 down in the foundation acts are presented in Table 8.2.

Table 8.2: Formal reasons for starting an environmental co-operative (put down in the foundation act), ordered from most important to most unimportant (associations and legal co-operatives, n=23), 1999

Reason:	Frequency
1. To contribute to wildlife and landscape management	22
2. Sustainability of the farms of the members	18
3. To act as intermediary between members and government	16
4. To improve contacts between farmers and non-farmers in the working area	12
5. To generate income from wildlife and landscape management	11
6. To contribute to the decrease of harmful effects of agriculture to environment	7
7. An organisation for the development of new ideas	6
8. To generate income from recreation	5
9. To generate income from regional products	4
10. To exchange experience between members	4
11. Other reasons	3
12. To Stimulate research	0

Source: Questionnaire data

Most of the organisations want to contribute to wildlife and landscape management and to contribute to the sustainability of the farms. They also view themselves as a "governance" structure between farmers and the government. Generating income is not always a reason to be stated formally (11 co-operatives out of 23, Table 8.2). Communication between co-operatives was an important source of ideas for new activities. Exchanging knowledge was not seen as an important reason for founding an environmental co-operative. Acquiring knowledge or exchange knowledge is also not seen as a main objective to be stated in the founding act or as a reason for farmers to become members of an environmental co-operative. The environmental co-operatives believe that it is important that the government offer better opportunities for self-regulation. They were convinced that they can achieve government objectives in the area of wildlife and landscape management in exchange for no extra regulation by the government.

8.5 Summary and conclusions

The majority of environmental co-operatives in the Netherlands (circa 70%) are formal associations and or legal co-operatives. This means that the majority of the environmental co-operatives have a club arrangement. A minority of the clubs were organised as foundations (25%). A club can be defined as a voluntary group of individuals who derive mutual benefits from sharing one or more of the following: production costs of activities and services, the members' characteristics (e.g., members have land, are farmers), or a good characterised by excludable benefits. Further, the results of the survey show that in most environmental co-operatives, members explicitly choose to join (voluntarily), and delegation of authority is from the bottom-up via voting. Environmental co-operatives use exclusion mechanisms whereby non-members and/or non-payers can be barred from, for instance, individual wildlife and landscape management contracting. However, it is difficult to exclude people from the benefits of beloning to a pressure group.

In order to become a legal entity environmental co-operatives have to follow the general rules and procedures in the Netherlands relevant to the institutional arrangement they want to choose. This means that the formal institutional environmental determines the institutional arrangement of environmental co-operatives. Although there exist general rules and procedures on organisational forms in the Netherlands, environmental co-operatives have different kinds of (formal) institutional arrangements. Differences between environmental co-operatives have been found regarding: objectives of the environmental co-operative, voting rules, membership fees, types of memberships, etc. Important is that environmental co-operatives, in the form of associations or foundations, are not allowed to redistribute profits among the members, whereas legal co-operatives may do this.

The influence of the informal institutional environment as an argument for founding a club played a role for farmers. The reference level of wildlife and landscape is used as a proxy variable for the institutional environment. This level represents the quality of wildlife and landscape the society finds it should be. "Wishes from society" measures the perceived (by the farmers) reference level in a society. For farmers "Wishes from society" played an important role as a reason for founding environmental co-operatives.

Chapter 9

Contractual arrangements within environmental co-operatives: design principles

9.1 Introduction

This chapter concerns the analysis of factors (design principles) that contribute to the success of environmental co-operatives. Initially, self-organised resource regimes can draw upon locally-evolved norms of reciprocity and trustworthiness and the likely presence of local leaders in most community settings (cf. Ostrom, 2000: 149). However, for long-term survival and success more is needed. In this thesis the comparative success of environmental co-operatives is examined to see whether these organisations cope with contractual arrangement failures and club organisation failures. The question is whether environmental co-operatives use design principles. In order to analyse this question contractual arrangement failure is split up into hidden information, hidden action, and the lack of commitment and trust.

Section 9.2 deals with design principles for reducing/limiting the problems resulting from institutional arrangement failures from a theoretical point of view. The design principles modify the quality of self-organising and self-governing. Section 9.3 looks at whether design principles are used in practice by environmental co-operatives. Section 9.4 consists of a summary and conclusions.

9.2 Design principles

In a perfect contract every contingency is anticipated; the associated risk is efficiently allocated between the parties; all relevant information has been communicated; nothing can go wrong. A perfect contract is also efficient if no transaction costs are involved. Each resource is allocated to the party who values it the most; each risk is allocated to the party who can bear it at least cost; and the terms of the contract exhaust the possibilities for mutual gain by co-operation between the parties (Cooter and Ulen, 1996: 186). If the contract is perfect, the parties do not need the government to regulate its terms (cf. Cooter and Ulen, 1996: 187). This also leads to a complete institutional arrangement (cf. Furubotn and Richter, 1997: 23). However, contracts are imperfect when the parties are irrational or transaction costs are positive. Contract failures are present if external constraints are necessary or if a contract is badly designed (Ménard, 2000: 238). The institutional arrangement could solve the problem - e.g. norms and trust - and lead to a perfect institutional arrangement, similar to a perfect contract. However, institutional arrangements are also susceptible to failure.

In this chapter design principles that contribute to overcoming institutional arrangement failures are derived from economic theory. The definition of design principles used here is: design principles are essential elements or conditions that help to account for the success of environmental co-operatives in producing goods and gaining compliance of generation after generation of farmers to the rules in use (cf. Ostrom, 1990: 90 and cf. Ostrom, 2000: 149-153). An example of a design principle is the use of individuals who actively monitor the behaviour of farmers.

It is important to keep in mind that institutional arrangements are incomplete, and therefore they should be considered incomplete from the outset. That is, institutional arrangements should be sufficiently flexible and open-ended that they will be able to adapt swiftly and at low cost to new circumstances (Furubotn and Richter, 1997: 29). In the remaining part of this section design principles to deal with information asymmetries are analysed and the lack of credible commitment and trust. The framework of this chapter is given in Figure 9.1. As already stated, the focus is on contractual arrangements and environmental co-operatives. The institutional environment is analysed only when that is relevant to institutional arrangements.

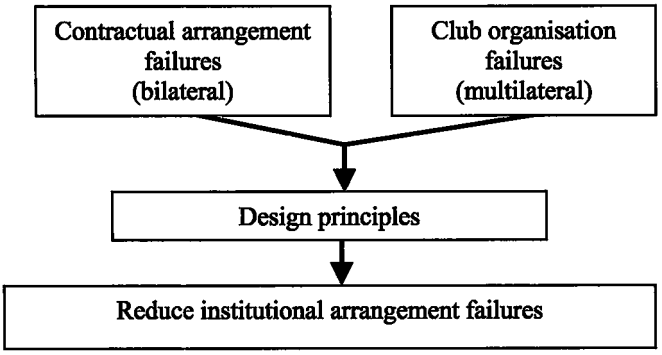

Figure 9.1: Design principles employed for dealing with contractual and club organisation failures.

The first row of Figure 9.1 relates to two main institutional arrangement failures distinguished in this chapter: contractual arrangement failures and club organisation failures. The following two types of contractual arrangement failures are distinguished: information asymmetries and lack of credible commitment and trust. Information asymmetries are split up into hidden action and hidden information. The way information is produced, transferred, and made credible are characteristic features of an organisation (Furubotn and Richter, 1997: 270). Information is not distributed equally to the partners in an institutional arrangement. However, information asymmetries are not a problem if people have congruent interests (Tirole, 1999: 764). To make promises trustworthy, credible commitments need to be established (Furubotn and Richter, 1997: 276). Agreements can be made binding by courts, however if this is not possible private enforcement is necessary. Club organisation failures are derived from the elements of clubs mentioned in Section 8.2. Design principles offer ways to reduce contractual and club organisation failures.

Hidden information

Hidden information can lead to adverse selection. In that case the environmental co-operative does not know if one of the (potential) members possesses private information which, if known to the environmental co-operative, would influence the attitude and conduct of environmental co-operative towards this (potential) member. Further, after signing of the contract, hidden information means that it is impossible or difficult to observe the disutility of the farmer from effort (if effort is observable).

Ways in which the problem of hidden information (*ex ante*) can be reduced are signalling, screening, and monitoring mechanisms *ex ante*. Signalling occurs when the better-informed party makes certain verifiable facts known, which, if properly interpreted, may indicate the presence of other unobservable but desirable characteristics. In signalling, the privately informed party takes the lead in adopting behaviour that reveals their information. For signalling to be effective, the receiver must believe that the signal is credible. That is, the observable characteristic must clearly point to the unobservable, desirable characteristic (FitzRoy et al., 1998: 247). A signal for the qualification of a potential member for his or her ability to preserve wildlife and landscape to the environmental co-operative could be his education. For example, did he follow a course in wildlife and habitats management? This means that the farmer has to take the initiative to follow a course. Screening refers to activities undertaken by the party without private information (principal) in order to separate different types of informed parties (agents) along some dimension. It is the uninformed party who undertakes activities in order to make the informed agents group or sort themselves into separate types. Screening means that one of the contracting partners demands certain elements in the set of observed characteristics that are correlated with unobserved but desirable elements. According to FitzRoy et al. (1998: 247), screening is a strategy sometimes available to an uninformed party that, if successful, will get the better-informed party to reveal information. An example of a screening mechanism is the requirement of delivering a certain minimum quantity or following a course.

Hidden action

Hidden action means that it is assumed that effort of the farmers cannot be observed by the environmental co-operative and hence it is not possible to cover effort in a contract. The kind of monitoring necessary is called effort monitoring (cf. Lyons, 1996:29). Hidden action is an *ex post* phenomenon. This problem can be resolved by monitoring and incentive contracts. In all known self-organised resource governance regimes that have survived for multiple generations, participants invest resources in monitoring and sanctioning the actions of each other so as to reduce the probability of free riding. For wildlife and landscape management, incomplete information in important and hence monitoring gives valuable information that can help parties take strategic decisions (cf. Ostrom, 1990: 96, and cf. Furobotn and Richter, 1997: 85). At the time of monitoring the farmer has not yet completed his action (Strausz, 2000: 339). Monitoring has to be distinguished from the verification of an agent's to-date performance (auditing), which takes place afterwards, when the other party decides, upon signals such as output reports, to check the agent's compliance (cf. Strausz, 2000: 339). Monitoring is meant to induce a farmer to go to a lot of effort. Monitoring costs depend on what rules are adopted and how contracts are crafted. However, when monitoring is difficult, farmers can alter their input, and with less-then-perfect detection, monitoring can then become ineffective and must be repeated successively. One of the problems is that the (specialised) monitor himself may shirk (Furubotn and Richter, 1997: 154). In case of hidden action monitoring is not perfect by definition. Incentive contracts make agents indirectly take the correct actions (those that would be contracted for if his actions were observable). Payment is made conditional on variables that are observable to induce farmers to make an effort. An alternative solution is to require posting of bonds to guarantee performance, which can be paid back if the performance is satisfactory or the targets are reached. Or the other way around: a farmer could be required to post "a bond" which he or she would forfeit if discovered shirking (cf. Ricketts, 2002: 187). In contrast to monitoring within the organisation monitoring from outside the organisation can have negative effects on the effectiveness of the organisation. Several recent experimental studies have confirmed the notion that external rules and monitoring can discourage co-operative behaviour (Ostrom, 2000: 147).

Commitment and trust

An important element in co-ordinating and motivating members of an environmental co-operative is commitment of the members to long-term contracts. Commitment means that a contract will be implemented if one of the parties to the contract wishes so (Laffont and Tirole, 1993: 437). The agents restrict their future actions in advance by pledging that they will stick to the contract until some predetermined date. Nothing prevents the parties form agreeing to alter the initial contract. Commitment can be achieved by foreclosing the opportunity to run away (Cooter and Ulen 1996: 170). To use a military analogy: burning the bridge behind you forecloses the possibility to retreat. It is a signal that you are willing to fight. However, the contracts within the institutional arrangement 'environmental co-operative' are mostly incomplete and complex, which gives rise to the problem of imperfect commitment. Given that relationship-specific investments are not contracted, incomplete contracts lead to hold-up problems. Changes in asset ownership can affect the severity of the hold-up problem (cf. Hart, 1995: 87). Imperfect commitment refers to the inability of parties to bind themselves to follow through on threats and promises that they would like to make, but which, having been made, they would later like to renounce. Asymmetric information plays a very limited role in the analysis of hold-up problems.

In general, communication facilitates co-operation. However, in situations that generate strong temptations to break mutual commitments or where there is a lack of common values and norms, an environmental co-operative cannot rely entirely on communication to sustain co-operation. Communication or commitment only is not enough, should it be credible. The crux of the problem of bringing about credible commitment in an environmental co-operative is monitoring conformance to a set of its own rules, graduated sanctions (sanctions depending on the seriousness and context of the offence) and conflict-resolving mechanisms. These activities should be carried out at low cost. Ostrom (1990: 45) emphasises the importance of monitoring: without mutual monitoring, there can be no credible commitment; without credible commitment there is no reason to propose new rules. The costs and benefits of monitoring depend on the rules adopted in an organisation. Contingent self-commitments and mutual monitoring reinforce one another, especially when appropriators have devised rules that tend to reduce monitoring costs (Ostrom, 1990: 100). A difference in monitoring between hidden action and commitment is that

monitoring for hidden action is related to the content of the contract whereas monitoring in the case of credible commitment is addressed to both formal and informal rules.

Monitoring can be performed by the environmental co-operative itself or an external supervisor (delegation) (cf. Strausz, 2000: 353). However, mutual monitoring or monitoring by volunteers reduces the costs. Farmers who violate the rules are likely to be assessed graduated sanctions, depending on the seriousness and context of the offence. If individuals are going to follow rules over a long period of time, there must be some mechanism for discussion and resolving what constitutes an infraction. The presence of a conflict-resolution mechanism does not guarantee that the farmers will be able to maintain the agreements. However it is difficult to imagine how any complex system of rules could ever be maintained over time without such a mechanism. Such a mechanism could be sometimes quite informal. Those who are selected as the leaders could be also the basic resolvers of conflicts (cf. Ostrom, 1990: 94 -101). Building an individual reputation within an organisation is another form of showing commitment to that organisation. However, according to Ostrom (1990: 93-94) it is clear from case studies that even in repeated settings where reputation is important and where individuals share the norm of keeping agreements, reputation and norms are insufficient by themselves to produce stable co-operative behaviour over the long run.

Nooteboom (1999: 25) emphasises – in a similar way as for commitment – the role and meaning of trust in transactions. Trust lowers the cost of search and monitoring, because trusting people are less secretive and more readily supply information. Trust reduces the costs of contracting and control because it diminishes fears of opportunism and builds acceptance of more influence among partners. In the case of trust, people will deliberate and renegotiate on the basis of give and take ('voice') rather than walk out ('exit') when conflicts arise. Often, trust based on friendship or kinship will not suffice as the basis for co-operation. Trust is nice and can work, but we have to take into account that trust may not always work (cf. Kreps, 1990: 580). There is some overlap for the sources of commitment and trust. Trust is closely related to social norms of behaviour, which is also an important element in commitment. However, commitment can also be realised with more formal rules or foreclosing alternatives. Both can have the same effect: reducing hidden action.

Club organisation failures

Club organisation failures differ from contract failures in the sense that they originate in group-processes. Only two types of club arrangement failure will be discussed: inadequate sharing rules and lack of an exclusion mechanism. First, clubs involve sharing in the use of an impure public good, the use of the service of the club, and sharing in the benefits. Sharing often leads to a partial rivalry of benefits as a larger membership crowd one another, detracting from the quality of the service received. Crowding and congestion imply that one user's utilisation of the club good decreases the benefit or quality of service still available to the remaining users. As such, crowding or congestion depends on the measure of utilisation, which could include the number of the members, the total number of the members who use the club's facilities, or the number of visitors to the areas or provisions of the club (cf. Cornes and Sandler, 1996: 348). Club congestion may assume diverse forms: long files, long waits, slower and less service, and in the case of wildlife and landscape, lower quality. As membership increases, both costs and benefits grow: Costs involve increased congestion, while benefits result from cost reduction owing to the sharing of the provision expense associated with the club good. By adding a (transaction) cost offset to the benefits derived from increasing membership, crowding leads to finite membership.

A second potential source of club organisation failure is the lack of an exclusion mechanism. For pure public goods, all individuals can be members without crowding taking place, so those non-members do not exist. For club goods, non-members to a given club have two options: they can join another club proving the same good, or they may not join any club offering the club good. In the case of non-members clubs need some kind of exclusion mechanism, whereby non-members and/or non-payers can be barred. Members can be excluded on a temporary basis in line with graduated sanctions. Without such a mechanism, there would be no incentives for members to join and to pay dues and other fees. The associated cost of operation and provision of an exclusion mechanism must be less than the benefits gained from allocating the shared good within an environmental co-operative.

An analysis of the costs of erection, operation and provision of an exclusion mechanism is important. If, for example, exclusion is not perfect owing to cost considerations, then free riders may utilise the club good. Field research confirms that the temptation to free-ride on the provision of collective benefits is a universal problem (Ostrom, 2000: 138). The design of the

exclusion mechanism, in terms of penalties and fees, needs to account for providing the proper incentive to both members and free riders. An important question is whether - based on exclusion cost arguments - an exclusion mechanism should include monitoring. The institutional form of a club may be tied to exclusion cost consideration (Cornes and Sandler, 1996: 350).

Overview design principles

Figure 9.2 gives an overview of ways or design principles to reduce the effects of contractual arrangement failures and club organisation failures based on the literature. The design principles are referenced by their general name. Some of these principles consist of different design principles that can be summarised under the given heading. Further, design principles are often complex mechanisms for which many variations exist or can be developed.

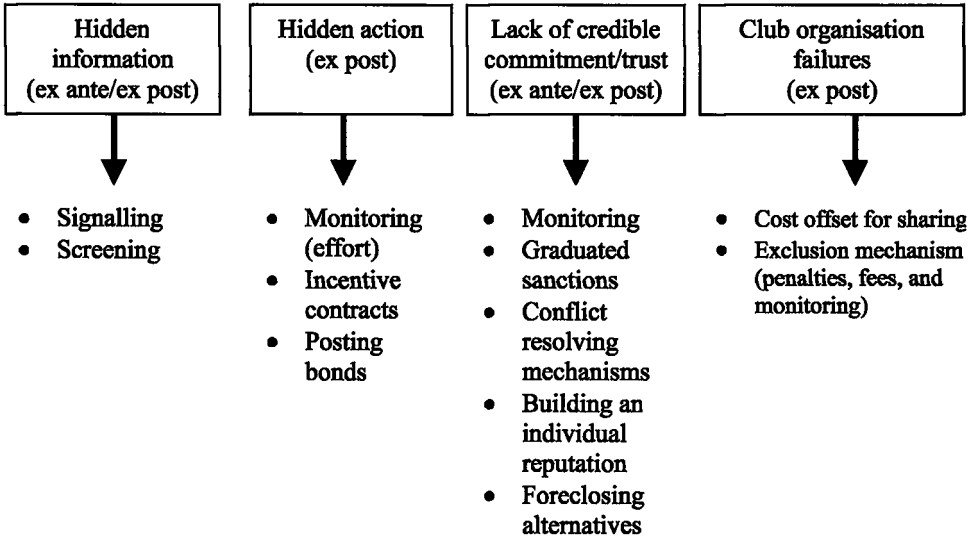

Figure 9.2: General design principles which reduce the effects of information asymmetries and the lack of credible commitment and trust

In Section 9.3, the ways environmental co-operatives take into account the design principles in their organisation is analysed. This does not mean that it is assumed that the institutional arrangement is always the result of careful planning, but the analysis focuses on the existing situation with respect to the application of design principles. The use of these design principles involves (transaction) costs; i.e. monitoring and conflict-resolving mechanisms are not for free.

9.3 *Currently applied design principles*

This section deals with the results of the mail survey[1]. This section focuses on the application of design principles in environmental co-operatives in the Netherlands. The categories of design principles mentioned in Chapter 9.2 are discussed on the basis the survey.

Screening and signalling

Table 9.1 gives an overview of the types of requirements the environmental co-operatives used before a farmer can become a member.

Table 9.1: Requirements for farmers for becoming member of an environmental co-operative (only associations and legal co-operatives, n=29)

Requirement	Number of environmental co-operatives
Yearly contribution	17
Yearly contribution plus payment per hectare	4
Yearly contribution plus entrance fee	2
Yearly contribution plus course enrolment	2
Payment per hectare	1
Payment per hectare plus entrance fee	2
Non compulsory yearly contribution	1

Source: Questionnaire data

[1] The survey itself is discussed in chapter 4

The majority of the organisations required a yearly fee. The average yearly fee was about € 20 per year. Only two associations had an entrance fee. It is questionable whether these entrance fees are high enough to function as a screening device. A few organisations had a yearly fee of about € 45. The payments per hectare ranged from € 1 - € 2.5 yearly. The incentive resulting from these fees will be higher. Only a few organisations used a course as a screening device: farmers have to follow a specific course before they can become member.

Monitoring

Monitoring to reduce the problem of hidden action is important for the co-operatives: 85% of the associations and legal co-operatives has some form of monitoring activity. Table 9.2 gives an overview of parties responsible for monitoring within environmental co-operatives.

Table 9.2: Parties responsible for monitoring of activities (only associations and legal co-operatives, number of observations = 29)

Monitor	Number of environmental co-operatives
Environmental co-operative (e.g. members, the board, employees)	24
Non-members (e.g investors, police)	11
Monitoring is under development	5
No monitoring	1

Source: Questionnaire data

From Table 9.2 follows that the co-operative itself played an important role in monitoring. One third of the organisations use an external party as monitor. More than 80 per cent of the organisations perform monitoring (evaluation) for their investors. Less than 10 of the organisations did not perform any monitoring or evaluations. Table 9.3 gives an overview of types of monitoring takes place.

Table 9.3: Types of monitoring of environmental co-operatives (only associations and legal co-operatives, number of observations = 29)

Type of measurement	Number of co-operatives
Measurement in the field only	4
Collecting data from farmers only	4
Both measurement in the field and collecting data	13
No measurement yet, but in development	3
No measurement, but judgement by external professionals	4
No measurement	1

Source: Questionnaire data

Of the environmental co-operatives that collected data from individual farmers only four use judgements of professionals. And of the organisations which both measure in the field and collect data, nine use judgements of professionals. External professionals do most of the assessment. Table 9.3 illustrates that environmental co-operatives use different mechanisms for monitoring. The organisations that only apply collecting data and judgements from external professionals do not monitor during the activity of preserving wildlife and landscape. From Table 9.4 it follows that the environmental co-operatives also rank monitoring as one of the important tasks they perform. The mean ranks indicate the same order of importance for the different reasons. The reasons are ordered according to their mean rank. The mean ranks in Table 9.4 are calculated as follows (cf. Siegel, 1956: 155-173):

$$R_j = \frac{\sum_{i=1}^{I} r_{ji}}{I}$$

where R_j = rank total for reason j

r_{ji} = Rank of reason j of co-operative i

I = total number of environmental co-operatives

The mean ranks indicate the order of importance for the different reasons. To analyse the answers on attitude questions non-parametric statistics were used. The analysis was applied to the relations within the whole set of alternatives. The null hypothesis is that the alternatives listed for a specific question are chosen equally. Friedman's two-way analysis of variance by ranks is used to decide whether to accept or reject the null hypothesis under a 5% level of significance (Siegel,

1956). The number of alternatives and clubs were large enough to apply these tests. For every club, the alternatives were ranked from 1 to k. Next, a mean rank was calculated for every alternative. In the case that every alternative were equally distributed, the mean ranks would be equal. The Friedman test determines whether the ranks of the alternatives differ significantly. The test statistic is distributed approximately as a χ^2-distribution.

*Table 9.4: Importance of different tasks of environmental co-operatives ordered from most important to least unimportant (only associations and legal co-operatives, n=23), 1999**

Factor		Mean Rank
1.	Being a pressure group	3.74
2.	Development of new ideas	4.41
3.	The exchange of knowledge and experience among members	4.52
4.	Consultations with societal organisations (e.g. environmental groups)	4.54
5.	Monitoring of the performance of tasks	4.89
6.	Stimulate research	5.33
7.	Disperse knowledge from outside among the members	5.48
8.	Administrative tasks	5.59
9.	Exchange knowledge and experience with non-members	6.50

**Medians for alternatives differ significantly for a 1 percent level,Friedman test (Siegel, 1956: 166-173), $\chi^2 = 22.0462$*
Source: Questionnaire data

Environmental co-operatives rate the protection of interests as the most important task they perform. Generating ideas and the exchange of knowledge and experience are also considered relatively important tasks. Monitoring and administrative tasks are not seen as key tasks of the environmental co-operatives.

Commitment and trust

Environmental co-operatives view the commitment of their members as one of the most important factors is a successful operation (Table 9.5). The mean rank is calculated similar to Table 9.4. It is considered one of the most important factors of success.

*Table 9.5: Factors contributing to the success of environmental co-operatives ordered from most to least unimportant (only associations and legal co-operatives, n=23), 1999**

Factor		Mean Rank
1.	Commitment to the activities on the part of members	3.65
2.	Financial support from the government	3.94
3.	Activities that improve the opportunities for the members	4.15
4.	A common vision among the members about societal restrictions for area	4.62
5.	Having activities that improve the opportunities for the area	5.00
6.	Professional support for the organisation	5.10
7.	A common vision of the club with the government	5.48
8.	A common vision of the club with societal organisations	6.31
9.	Having a monitoring system and sanctions within the organisation	6.75

**Medians for alternatives differ significantly for a 1 percent level, Friedman test (Siegel, 1956: 166-173), $\chi^2 = 51.328$,*
Source: Questionnaire data

External funding is ranked as the second most important factor for success, and activities that increase the opportunities of members as the third most important factor. Increasing opportunities for the members is a source of building in self-interest of the farmers in the co-operative. A common vision with other groups or organisations like the government is less important for success. Monitoring and sanctions are ways to increase credible commitment used by the co-operatives. Table 9.6 gives an overview of the sanctions available within environmental co-operatives.

Table 9.6: Possible sanctions within environmental co-operatives (associations and legal co-operatives, n=29), 1999

Sanction	Number of organisations
Warnings	12
Make names public of members who do not follow rules	1
Financial penalties	7
Temporary postponement of membership	3
Permanent withdrawal of membership	6
Temporary exclusion from activities	9
No sanction available yet	7

Source: Questionnaire data

Most of the co-operatives have the ability to use sanctions (75%), although many organisations are still developing (new) sanctions. The most important options for sanctions are warnings, followed by a temporary exclusion of activities, suspending members, excluding them from activities and imposing penalties. About 50% of those organisations that have the opportunity to use sanctions having the possibility of using sanctions have the opportunity to use more than one type of sanction. The possibility of using types of sanctions which differ in their level of punishment suggests the presence of graduated sanctions, which is important for achieving credible commitment.

Whether the sanctions are actually imposed is also important for judging the degree of commitment showed by one of the parties to the contract. About 30% of the organisations utilised sanctions. Several types of conflict resolving mechanisms are used by environmental co-operatives. Often the board or the general membership meeting decides about sanctions in the case of a conflict with members. Other co-operatives have the possibility of establishing an arbitration committee.

Design principles related to club organisation

Important activities of environmental co-operatives are concluding contracts with individual farmers and being a pressure group. Such kinds of activities involve sharing costs and benefits. Sharing may cause problems if the club shares the costs, but the benefits are owned privately like marketable goods. In the case of marketable, regional and recreational products, such a trade-off is possible. Payments per hectare relate the use of the club facilities to the payment to be made (see Table 9.1) and can prevent congestion.

The presence of non-members who benefit from the club can spoil the effects of the club. In most environmental clubs farmers are members voluntarily. In areas with environmental co-operatives, on average about 50% of the farmers are members of a co-operative. This means there are non-members in such an area and exclusion mechanisms are necessary. Non-members can be excluded from the benefits of the club arising from the contracting-part. However, it is difficult to exclude non-members from activities like being a pressure group. Being a pressure group is seen as one of the most important tasks environmental co-operatives have. Excluding non-members from concluding wildlife and landscape management contracts with the environmental co-

operative is an external exclusion mechanism. Exclusion in the form of withdrawal of membership can be temporary or permanent (see Table 9.6). Another possibility is the a temporary exclusion from activities.

9.4 Summary and conclusions

Design principles employed for limiting the problems resulting from contractual arrangement failures and environmental co-operative arrangements are the main subject of this chapter. The contractual arrangement failures consist of asymmetric information, like hidden information and hidden action, and the lack of credible commitment and trust. Club organisation failures result from the lack of sharing rules, inefficient voting arrangements, and exclusion mechanisms. These problems influence the effectiveness and efficiency of self-organising and self-governing forms of co-operation for management of wildlife and landscape. In our research evidence was found for the application of design principles in the environmental co-operatives in the Netherlands for reducing:

- *Hidden information*

  Design principles used to reduce the problems of hidden information are signalling and screening. In our empirical research evidence was found for the presence of screening and signalling.

- *Hidden action*

  The problems of hidden action and hidden information can be resolved by effort monitoring and incentive contracts. An alternative solution is to require posting of bonds to guarantee performance, which can be paid back if the performance is satisfactory or if the targets are reached. The survey showed that monitoring plays an important role in environmental co-operatives, and that less attention is paid to the other possibilities.

- *Credible commitment and trust*

  Credible commitment and trust can be created in an environmental co-operative via monitoring, graduated sanctions, conflict-resolution mechanisms, reputation and foreclosing alternatives. Evidence was found that most co-operatives have the possibility of using graduated sanctions. The observed use of sanctions can contribute to the establishment of credible commitments by the environmental co-operative. There are several types of conflict-resolving mechanisms in use. Since co-operatives have existed for only a short time many organisations and activities are still developing. Due also to this, reputation building has not yet been possible for many organisations.

- *Club organisation failures*

  Environmental co-operatives use exclusion mechanisms, whereby non-members and/or non-payers can be barred. These mechanisms work in the case of wildlife and landscape management contracting, but are less effective regard to their belonging to a pressure group.

Summarising, most environmental co-operatives use all kinds of design principles which enable them to cope with hidden information, hidden action and club organisation failures, and help them to show credible commitments and trust with respect to wildlife and landscape management.

PART IV SYNTHESIS

Chapter 10

Institutional arrangements for wildlife and landscape management; outlook on future research

10.1 Introduction

Central in this thesis is an analysis of wildlife and landscape management on Dutch farms. This chapter forms a synthesis of preceding chapters and gives an outlook on future research. Institutional arrangements for wildlife and landscape are discussed in Section 10.2. Section 10.3 looks at future research concerning wildlife and landscape management.

10. 2 Institutional arrangements for wildlife and landscape management

In order to increase supply of wildlife and landscape by farmers in the Netherlands a number of organisations offer wildlife and landscape management contracts to farmers, like governmental agencies, environmental co-operatives, and provinces. Farmers can conclude these contracts voluntarily. The important question is how should these contracts look like, in other words, what design is appropriate for such contracts. Contract design is vital for all the parties to a contract because it determines the "what, where, when, how" of a transaction.

One of the elements of appropriate contract design depends on the transaction at stake. It should be clear what kind of service or good is to be bought or sold. Following transaction cost economics, wildlife and landscape management transactions can be described in terms of asset specificity, uncertainty, and frequency. Asset specificity refers to the degree to which an assets is committed to a specific task, and thus cannot be redeployed to alternative uses without loosing the majority of its value. From the empirical analysis in this thesis it follows that asset specificity

is relevant; e.g. site specificity and learning-by-doing are important. Furthermore, transactions involve different degrees of uncertainty concerning, for instance, ecological aspects of wildlife and landscape and future governmental policies. Finally, the frequency of a wildlife and landscape management transaction is mostly yearly and recurrent.

The transaction having been described, determining which institutional arrangement best fits the transaction is an important consideration. Institutional arrangements are meant to provide a structure within which its parties can co-operate or compete to obtain some added income that is not available outside this arrangement. A market arrangement with prices as the only co-ordination mechanism will fail due to the attributes of wildlife and landscape management transactions, for instance due to the specific assets involved. Hierarchical institutional arrangements will only be relevant at high levels of specific investments, uncertainty and frequency. However, that is not the case for wildlife and landscape management by farmers. In line with New Institutional Economics and the attributes of the transaction it follows that hybrid arrangements are appropriate for these transactions. Hybrid arrangements consist of elements both of markets and hierarchies. However, other means of co-ordination are used besides prices and hierarchy, such as reciprocity and trust.

The use of hybrid arrangements means that solutions that work well for transactions on spot markets will not work for wildlife and landscape management contracting by farmers. For instance, for transactions on markets the identity of the parties plays no role. However, identity is important for hybrid arrangements like wildlife and landscape management. Transactions for wildlife and landscape management differ in their attributes (asset specificity, frequency and uncertainty), implying that different types of hybrid arrangements are useful. An arrangement will fail to co-ordinate efficiently and effectively if the institutional design is not optimal for the attributes of a transaction. Possible problems are hidden action, hidden information and lack of credible commitment and trust. Design principles such as monitoring and graduated sanctions can be used to cope with these problems. Given the diversity of design principles different hybrid arrangements can be designed (or they evolve). This thesis shows that governmental agencies and others apply these design principles for wildlife and landscape management contracts.

There is a trade-off between the costs and benefits of using ontractual arrangements designed to cope with attributes of a specific transaction, and the cost and benefits of using more

general types of contractual arrangements for all kinds of transactions. Policy makers should keep in mind that more complete contractual design involves higher costs compared to more incomplete contracts. The benefit of designing contracts to regulate every thinkable transaction contingency can burden farmers with high transaction costs, for instance in administrative costs, which makes contracts less attractive. This should be of relevance especially to policy makers who intend to govern wildlife and landscape in detailed and complex ways.

Environmental co-operatives can function as an alternative to direct contracting by government agencies with individual farmers. They can perform (parts of) the tasks of the government or perform tasks of individual farmers collectively. By doing so both can save on transaction costs for wildlife and landscape management, depending on the transaction at stake. Most environmental co-operatives can be characterised as clubs which use all kinds of design principles to make credible to contracting partners their commitment to wildlife and landscape management. The institutional arrangements of environmental co-operatives vary for different organisations.

List of conclusions

At the end of this thesis a number of conclusions can be drawn. An enumeration of the most important conclusions of the research is listed below.

- Wildlife and landscape management in agriculture is governed by hybrid institutional arrangements (contractual arrangements and environmental co-operatives) that combine elements from markets, hierarchies and other modes of co-ordination.
- Contractual arrangements for wildlife and landscape management are rather complex and incomplete arrangements.
- Farm characteristics influence the decision to manage wildlife and landscape. These characteristics determine the need for specific investments for wildlife and landscape management.
- Environmental co-operatives can be characterised as clubs. However, variations in their institutional arrangements can be observed.

- Environmental co-operatives are founded to cope with market failure, to save on transaction costs, to build up countervailing power, to form an alternative to government intervention and to prevent hold-up problems.
- The institutional arrangement of environmental co-operatives is influenced by formal and informal rules in Dutch society (the institutional environment).
- Environmental co-operatives regulate the institutional design of their organisation, which contributes to their ability to cope with (potential) institutional arrangement failures.
- Contractual arrangements and environmental co-operatives are suitable arrangements for the provision of wildlife and landscape management by farmers. They help avoid institutional arrangement failures and offer an alternative to market failures and direct government intervention.

10.3 Outlook on future research

New Institutional Economics has provided a good theoretical basis for this thesis. The literary approach combined with surveys proved to be a useful approach for analysing institutional arrangements. The additional use of models was helpful in analysing wildlife and landscape management. Most of the data collected until now has not concerned transactions but been focused on production and related issues. In the Dutch Farm Accountancy Data Network no information was available on the kind of institutional arrangement farmers were involved with regarding wildlife and landscape management. Had this data been available, and for a longer period, more formal models could have been developed. Hence, future research will benefit from data collection on these kinds of issues. However, collecting data on these issues does not mean that existing data on production issues is not relevant anymore, but additional collection of data on transactions would open more opportunities for combined research on technological and institutional aspects. The surveys used in this thesis were a main tool for data collection on transactions. They provided useful data for this thesis. In that sense they could form a starting point for more structured data collection on transactions for wildlife and landscape management.

Distinguishing design principles is useful for analysing different contractual arrangements. Important issues are: what kind of design principles are used; how design principles work in practice; the consequences of differences between design principles, and how they interact with each other. In practice organisations use many different mechanisms for a range of institutional arrangement failures. Examples of design principles are signalling, screening, monitoring, and graduated sanctions. Empirical research based on surveys and detailed case-studies will contribute to a better understanding of these mechanisms. Moreover, the results of such research could lead to a better design of contractual arrangements for wildlife and landscape management.

In this study of institutional arrangements for wildlife and landscape management it was necessary to make choices about the central focus. Thus an analysis of the demand for wildlife and landscape management by farmers, as well as an analysis of ecological aspects concerning wildlife and landscape, were left out. This thesis has concentrated rather on the supply side, especially on the institutional organisation. Research focussing on institutional aspects of wildlife and landscape management contributes to the study of wildlife and landscape because it helps to establish a link between supply and demand. This study has shown that contractual arrangements and environmental co-operatives are suitable arrangements for the provision of wildlife and landscape, and that they deserve further attention from the viewpoint of empirical science as well as of policy makers.

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SUMMARY

This thesis focuses on land use in which agriculture is combined with managing wildlife and landscape. The objective of this thesis is to analyse the design of contractual arrangements for wildlife and landscape management by farmers. The methodology applied in the thesis is illustrated by the research process of the project. The research process consisted of three stages: (1) development of an initial theoretical framework and conceptual model for institutional analysis; (2) the analysis of empirical objects; (3) a final analysis. The empirical objects were: (1) a direct relation between individual farmers and public and/or private contractors (contractual arrangement) and (2) an indirect relation between farmers and public and/or private contractors (environmental co-operatives). An important method used in this thesis is a literary approach combined with statistical tools using data from mail surveys. The literary approach is based on theory and makes use of close reasoning. The surveys were evaluated taking into account the sampling and non-sampling errors. Other methods were formal models concerning the decision to contract and the consequences of contracting at the farm level.

Standard microeconomic theory focuses on the market as exclusive mechanism for co-ordinating economic activities. However, when the economic environment significantly departs from the artificial neo-classical pattern the market will fail to produce Pareto-optimal outcomes. Then, an alternative to a market is government intervention. However, also the government often fails. Both kinds of failures are examples of institutional arrangement failures. New Institutional Economics is concerned with the question of which institutional arrangement is economically efficient under what circumstances.

The basic elements of the framework for analysing wildlife and landscape management are the institutional environment and institutional arrangements. The institutional environment is the set of fundamental political, social, and legal ground rules that establish a basis for production, exchange and distribution and are concerned with composite levels of activities. The institutional environment depends on place and changes in time, and is defined on an aggregate level.

In a society there exist all kinds of arrangements between individuals, individuals and groups, or between groups. An institutional arrangement is designed to provide at least a structure in which its members can co-operate or compete. Institutional arrangements can be formal and/or informal. Two of them can be distinguished as extreme poles: markets, and

hierarchical organisations. The areas of overlap between markets and hierarchical organisations give rise to hybrids. These hybrids use other means of co-ordination besides prices and hierarchy. Hybrids are co-ordinated and conducted by active forms of governance which emanates from the partners, and operate through authority. In order for authority to be efficient, it requires mutual consent and commitment.

From the institutional economics analysis in chapter 2 it follows that the following characteristics are relevant to analysing institutional arrangements:

1. The transaction;
2. The influence of the institutional environment with respect to time, place and level;
3. The instruments of an arrangement: incentive intensity, administrative controls and authority;
4. Performance attributes: autonomy and co-operation adaptation;
5. The role of contract law;
6. The clarity of residual control rights;
7. Type of contractual arrangement.

Differences among contracts correspond to the characteristics of the institutional arrangements in which they are embedded. Along with the differences in institutional arrangements, contracts differ in the following key elements:

1. Relevance of the identity of parties;
2. Contract duration: discrete exchange or indeterminate duration;
3. Degree of completeness;
4. Enforcement procedures.

The characteristics of institutional arrangements and the key elements characterising contracts show that order can be brought into the array of available institutional arrangements and contracts.

The third chapter is concerned with identifying an appropriate institutional arrangement for wildlife and landscape management transactions between contractors like government, large wildlife and landscape management organisations, and individual farmers. The framework developed in Chapter 3 illustrates the complexity of the relations between environmental co-

operatives, governmental agencies and individual farmers. These institutional arrangements are determined by the individuals and groups, the institutional environment, and by resource allocation and employment. In turn these institutional arrangements influence individuals and groups, the institutional environment, and resource allocation and employment. Measurement problems with respect to the attributes of transactions pose a problem to wildlife and landscape management transactions. The cost of measuring wildlife and landscape management means that incomplete contracts will be signed and that the wants of contractors like the government cannot be fully specified.

From New Institutional Economics and the attributes of wildlife and landscape management it follows that hybrid arrangements for combining agriculture and wildlife and landscape management can be expected. The market, with prices as the only co-ordination mechanism, will fail due to the particular attributes of wildlife and landscape management. Due to the relation between institutional arrangements and contracts it follows that the contract is a neo-classical contract. This means that the asset specificity is high enough to create mutual dependency among the contracting partners. Contracts will be incomplete and adjustments to contracts are important, as is the duration of the contracts. Because of incompleteness, disputes will be more frequent and are less likely to be solved by formal procedures.

Chapter 5 focuses on institutional arrangements for wildlife and landscape management in which individual farmers are involved. The results of a Tobit model show that farm characteristics were important for the probability of contract conclusion, and the amount of wildlife and landscape management. Especially farm characteristics related to present or earlier site-specific investments determine the probability of concluding contracts for wildlife and landscape management. External production circumstances (water drainage and the proportion of non-farmland) played an important role. If farm characteristics are well adapted for wildlife and landscape, less specific investments are needed to manage wildlife and landscape. The number of contracts and the revenue per contract increase in time due to changing attitudes of farmers and more opportunities for contracting. There were no differences between the regions. The empirical analysis provides a number of quantitative results. They should be handled with care, because estimations were not very stable.

After a contract has been concluded the characteristics of a transaction and contractual arrangement can be analysed. A survey among individual farmers was developed concerning

wildlife and landscape management. Elements of this survey were the number of arrangements, the complexity of an arrangement, property rights and transaction costs. Most farmers had only one relation with a contracting party (governmental agency, environmental co-operative, nature conservation organisation, etc.). The majority of the farmers were involved in more than one transaction type at the same time (preservation, development, maintenance, products delivered). These transaction types were concluded with one of the three contracting parties distinguished in chapter 5. Different transaction types within one institutional arrangement make these arrangements complex. Using institutional arrangements of a more or less similar institutional design make the contracts differ in the degree of completeness, depending on the transaction at stake. More incompleteness results in an increased exposure to opportunism.

Physical specific investments were used, although they were not large or specific. This result is comparable to the results of the Tobit model. Human asset specificity in form of learning-by-doing was important for most farmers. Compared with the Tobit model, the survey allowed directing the measurement more towards the relevance of human asset specificity. Parcels used for wildlife and landscape management had a relatively high percentage of attributes representing attractiveness for wildlife and landscape management. Sources of knowledge were the help of volunteers and professional journals. The involvement of volunteers as an extra party to the contractual arrangement increases the complexity. Farmers had the opinion that they owned a large share of the property rights with respect to land. Wildlife and landscape management was not considered an important source of income risk to total farm income. It was also not considered an important strategy for coping with income risks on a farm. Wildlife and landscape management was not an important factor for reducing income risk at the farm level. The cost of labour determine the transaction costs in monetary terms.

The objective of chapter 6 was to develop a theoretical and empirical model for analysing the decisions of individual farmers whether or not to manage wildlife and landscape, and how much of these services to produce in a situation with and without co-operation from other farmers. The motivations for co-operation analysed are: (1) reduction of transaction costs and (2) building up of bargaining power. The model is applied to Dutch dairy farmers as the main users of agricultural land in the Netherlands.

The reduction of fixed transaction costs makes it attractive for farmers to form an environmental co-operative in case of a fixed price for wildlife and landscape services. Therefore

more wildlife and landscape services are produced. However price - and therefore marginal costs - does not change, so if a farmer already produced wildlife and landscape services before the co-operative existed, his production does not change, but his profit does. If demand is no longer perfectly elastic (price is endogenous), an increase in wildlife and landscape services production leads to lower prices offsetting part of the production and profit increase caused by lower fixed transaction costs. However, if the environmental co-operative acts as a monopolist, an improved bargaining position leads to a decrease in the production of wildlife and landscape services and higher prices. but also to a smaller number of farmers producing wildlife and landscape services. This situation could still be socially optimal, compared to a situation without the co-operative, because of a potential reduction in public transaction costs. The latter result show the importance of the entrance policy of the co-operative: who can become a member and under which conditions?

Results presented in Chapter 6 are obviously subject to some qualifications. First, the model is a short-term model. Changes in technology are, for example, not accounted for. Moreover, aggregate welfare analysis is not possible because the model does not contain consumer benefits and public transaction costs. Extending the model in this direction could be worthwhile in future research. Notwithstanding these qualifications the model presented is a powerful tool for the study wildlife and landscape management and the motives for forming environmental co-operatives.

In Chapter 7 a general description of environmental co-operatives cites the number co-operatives, their geographical distribution, relevance for agricultural land use, activities and problems. In 1999 about 80 environmental co-operatives had about 6600 farmer members/participants and 1600 non-farmer members/participants. On average 6% of the total agricultural area was in use by environmental co-operatives. The average size of a single environmental co-operative was about 1600 ha. Most co-operatives were active in the northern and western Netherlands. In regions where a co-operative is located, about 50% of the farmers were members of an environmental co-operative. About 75% of the environmental co-operatives concluded contracts with individual farmers. These contracts ranged from maintaining hedges and farmland margin management, to tolerating meadow birds or geese. The main activities of an environmental co-operative were managing impure public goods like wildlife and landscape. Important services of environmental co-operatives were consultation with others on behalf of the

members, or working as a pressure group. Lack of financial resources, governmental regulation and available time were the main problems of environmental co-operatives.

Five main explanations for the development of environmental co-operatives are discussed from an institutional economics point of view. They are a way to: (1) cope with market failure; (2) save on transaction costs; (3) build up countervailing power; (4) provide an alternative to government intervention; and (5) prevent hold-up problems. From the survey on environmental co-operatives (1999) it followed that these explanations were recognised as reasons for founding environmental co-operatives. Ranked in order of importance, elements of these explanations were: contributing to wildlife and landscape management, reacting to societal wishes, being an interest group, generating income from wildlife and landscape, and restrictions on farming opportunities following the development of wildlife and landscape management areas.

The majority of environmental co-operatives in the Netherlands were formal associations and or legal co-operatives (circa 70%). This means that the majority of the environmental co-operatives had a club arrangement. A minority of the environmental co-operatives were organised as foundations (25%). A club can be defined as a voluntary group of individuals who derive mutual benefits from sharing one or more of the following: production costs of activities and services, the members' characteristics (e.g., members have land, are farmers), or a good characterised by excludable benefits. Furthermore, the results of the survey show that in most environmental co-operatives, members explicitly choose to join (voluntarily), and delegation of authority is from the bottom-up via voting. Environmental co-operatives use exclusion mechanisms whereby non-members and/or non-payers can be barred from, for instance, individual wildlife and landscape management contracting. However, it is difficult to exclude people from the benefits of belonging to a pressure group.

In order to become a legal entity environmental co-operatives have to follow the general rules and procedures in the Netherlands relevant to the institutional arrangement they want to choose. This means that the formal institutional environmental determines the institutional arrangement of environmental co-operatives. Although there exist general rules and procedures on organisational forms in the Netherlands, environmental co-operatives have some different kinds of (formal) institutional arrangements. Differences between environmental co-operatives have been found regarding: objectives of the environmental co-operative, voting rules, membership fees, types of memberships, etc. Important is that environmental co-operatives, in

the form of associations or foundations, are not allowed to redistribute profits among the members, whereas legal co-operatives may do this.

The influence of the informal institutional environment as an argument for founding a club played a role for farmers. "Wishes of society" measures the perceived (by the farmers) reference level in a society. This level represents the quality of wildlife and landscape which the society believes should exist. The reference level of wildlife and landscape is used as a proxy variable for the institutional environment.

Design principles employed for limiting the problems resulting from contractual arrangement failures and environmental co-operative arrangements are the main subject of chapter 9. The contractual arrangement failures consist of asymmetric information, like hidden information and hidden action, and lack of credible commitment and trust. Club organisation failures result from lack of sharing rules, inefficient voting arrangements, and exclusion mechanisms. These problems influence the effectiveness and efficiency of self-organising and self-governing forms of co-operation for management of wildlife and landscape. In our research evidence was found for the application of design principles in the environmental co-operatives in the Netherlands for reducing:

- *Hidden information*

  Design principles used to reduce the problems of hidden information were signalling and screening. In our empirical research we found evidence for the presence of screening and signalling.

- *Hidden action*

  The problems of hidden action and hidden information can be resolved by effort monitoring and incentive contracts. An alternative solution is to require posting of bonds to guarantee performance, which can be paid back if the performance is satisfactory or if the targets are reached. The survey showed that monitoring plays an important role in environmental co-operatives, and less attention is paid to the other possibilities.

- *Credible commitment and trust*

  Credible commitment and trust can be created in an environmental co-operative via monitoring, graduated sanctions, conflict-resolution mechanisms, reputation and foreclosing alternatives. Evidence was found that most co-operatives had the

possibility of using graduated sanctions and monitoring. The observed use of sanctions can contribute to the establishment of credible commitments by the environmental co-operative. There were several types of conflict-resolving mechanisms in use. Since co-operatives have existed for only a short time many organisations and activities were still developing. Due also to this, reputation building has not yet been possible for a large number of organisations.

- *Club organisation failures*

  Environmental co-operatives use exclusion mechanisms, whereby non-members and/or non-payers can be barred. These mechanisms work well in case of wildlife and landscape management contracting, but are less effective with regard to their belonging to a pressure group.

Summarising, most environmental co-operatives use all kinds of design principles which enable them to cope with hidden information, hidden action and club organisation failures, and help them to show credible commitments and trust with respect to wildlife and landscape management.

SAMENVATTING (Summary in Dutch)

Dit proefschrift richt zich op vormen van grondgebruik waarbij landbouw wordt gecombineerd met het beheer van natuur en landschap. Het doel van dit proefschrift was een analyse van institutionele aspecten van contractuele arrangementen voor het beheer van natuur en landschap door boeren. Het verloop van het onderzoek kan worden weergeven aan de hand van de volgende drie fasen: (1) De onwikkeling van een initieel raamwerk en conceptueel model voor institutionele analyse; (2) de analyse van empirische objecten en (3) een eindanalyse. De empirische objecten worden gevormd door (1) een directe relatie tussen individuele boeren en de overheid en/of private partijen (contractueel arrangement) en (2) een indirecte relatie tussen boeren en de overheid en/of private partijen via een milieucoöperatie. Een belangrijke methode binnen dit proefschrift is de "literary approach" gecombineerd met een statistische analyse van enquêtes. Een literary approach is gebaseerd op de theorie en maakt gebruik van redeneringen op basis van dezelfde theorie. Andere methoden waren formele modellen betreffende de beslissing om contracten aan te gaan en modellen om de gevolgen van het afsluiten van contracten op bedrijfsniveau te analyseren.

De standaard micro-economische theorie richt zich met name op de markt als exclusief mechanisme voor het coördineren van activiteiten. Indien de economische omgeving significant afwijkt van het kunstmatige neoklassieke patroon zal de markt falen en geen Pareto optimale uitkomsten opleveren. Overheidsingrijpen wordt dan vaak gezien als remedie, echter ook de overheid kan falen. Beide vormen van falen zijn voorbeelden van het falen van institutionele arrangementen. De Nieuwe Institutionele Economie richt zich op vraag wanneer institutionele arrangementen wel efficiënt en effectief zijn.

De institutionele omgeving en institutionele arrangementen vormen de bouwstenen van het raamwerk in dit proefschrift om natuur- en landschapsbeheer te analyseren. De institutionele omgeving is de set van fundamentele politieke, sociale, en rechts grondregels die van belang zijn voor productie, ruil en verdeling. De institutionele omgeving hangt af van plaats, verandert in de tijd en is gedefinieerd voor activiteiten op een geaggregeerd niveau.

In een samenleving bestaan allerlei arrangementen tussen individuen, individueen en groepen en tussen groepen. Een institutioneel arrangement is ontworpen om op zijn minst een structuur te geven waarin haar deelnemers kunnen samenwerken of concurreren. Institutionele

arrangementen kunnen formeel en/of informeel zijn. Markten en hiërarchieën zijn de twee uitersten vormen van institutionele arrangementen. In de gebieden waar deze uitersten elkaar overlappen ontstaan hybride vormen. Deze hybride vormen gebruiken naast prijzen en hiërarchische relaties ook andere coördinatiemechanismen zoals autoriteit. Voor autoriteit zijn wederzijdse toestemming en betrokkenheid essentieel.

Uit de institutionele analyse in hoofdstuk 2 volgt dat de volgende karakteristieken relevant zijn bij de analyse van institutionele arrangementen:

1. De transactie;
2. De invloed van de institutionele omgeving met betrekking tot tijd, plaats en niveau;
3. De instrumenten van een arrangement: incentivies, formele controle en autoriteit;
4. Prestatie attributen: autonome veranderingen en gecoördineerde veranderingen;
5. De rol van het contractrecht;
6. Duidelijkheid omtrent residuele controle rechten;
7. Het type arrangement.

Verschillen tussen contracten corresponderen met de karakteristieken van de institutionele arrangementen waarin zij verankerd zijn. Samen met de verschillen in institutionele arrangementen verschillen contracten op de volgende punten:

1. Het belang van de identiteit van de partijen;
2. De contractduur;
3. De mate van compleetheid;
4. De aanwezigheid van waarborgen.

De karakteristieken van institutionele arrangementen en de basis elementen van contracten illustreren dat orde kan worden aangebracht in de verzameling institutionele arrangementen en contracten.

Het derde hoofdstuk richt zich op de identificatie van een geschikt institutioneel arrangement voor transacties voor natuur- en landschapsbeheer tussen individuele boeren en partijen zoals de regering en grote natuurbeschermingsorganisaties. Het raamwerk dat werd ontwikkeld in hoofdstuk 3 illustreert de complexiteit van de relaties tussen milieucoöperaties, overheden en individuele boeren. De institutionele arrangementen worden bepaald door

individueen, groepen, de institutionele omgeving, en de beschikbaarheid van resources en arbeid. Op hun beurt beïnvloeden institutionele arrangementen het gedrag van individueen, groepen, de institutionele omgeving, en de beschikbaarheid van resources en arbeid. Meetproblemen die betrekking hebben op de attributen van transacties voor natuur- en landshapsbeheeer betekenen dat de contracten niet compleet zullen zijn en dat de wensen van de verschillende partijen zoals de overheid niet allemaal in een contract kunnen worden vastgelegd.

Uit de attributen van natuur- en landschapsbeheer volgt dat hybride contracten voor het beheer van natuur en landschap kunnen worden verwacht. De markt, met prijzen als enig coördinatiemechanisme zal falen door de specifieke attributen van natuur en landschapsbeheer. Door de relatie tussen institutionele arrangementen en contracten volgt dat een neoklassiek contracten verwacht mag worden. Dit betekent dan de specificiteit van het productiemiddelen hoog genoeg is om onderlinge afhankelijkheid tussen de partijen te laten ontstaan. De contracten zullen incompleet zijn en aanpassingen in de loop van de tijd van contracten zijn van belang evenals de duur van het contract. Door de mate van incompleetheid zullen zich regelmatig conflicten voor doen die niet altijd door formele procedures zullen worden opgelost.

Hoofdstuk 5 richt zich op institutionele arrangementen waarin individuele boeren deel kunnen nemen. De resultaten van een Tobit model laten zijn dat bedrijfskarakteristieken belangrijk waren voor de kans op het afsluiten van een contract voor natuur- en landschapsbeheer. In het bijzonder bedrijfskarakteristieken gerelateerd aan locatie specifieke investeringen bepalen deze kans. Externe productieomstandigheden (ontwatering en het aandeel niet agrarische grond op een bedrijf) spelen hierbij een belangrijke rol. Het aantal boeren dat contracten afsluit neemt toe in de tijd door een veranderende houding van boeren en door een toename van de mogelijkheden om overeenkomsten af te sluiten. Er zijn geen verschillen tussen regio's waargenomen.

Nadat een contract voor het beheer van natuur en landschap is afgesloten kunnen de karakteristieken van de transactie en de contractuele arrangementen worden geanalyseerd. De meeste boeren hadden een relatie met één andere partij: overheden, milieucoöperaties, natuurbeschermingsorganisaties, etc. De meerderheid van de boeren was in meer dan één transactietype betrokken zoals het behouden van een bestaande natuurlijke of landschapplijke situatie, het ontwikkelen van natuur en landschap, het onderhouden van een landschapselement en het leveren van natuur- en landschapsproducten. Deze transactietypes konden worden

afgesloten met diverse partijen. Verschillende transactietypen binnen een institutioneel arrangement maken deze arrangementen complex. Het gebruik van institutionele arrangementen van een vergelijkbaar design resulteert in een verschillende mate van compleetheid, afhankelijk van het type transactie. Indien de mate van incompleetheid van een contractueel arrangement toeneemt wordt de kans op opportunisme groter.

De gereedschappen en machines die werden gebruikt voor het beheer van natuur en landschap waren niet erg specifiek en de omvang van de investering bleef vaak beperkt. Dit resultaat is vergelijkbaar met de uitkomsten van het al eerder besproken Tobit model. Menselijk specifieke investeringen in de vorm van *"al doende leren"* waren van belang voor de meeste boeren. Percelen die worden gebruikt voor het beheer van natuur en landschap hadden een relatief hoge score op attributen van grond die het beheer van natuur en landschap attractiever maken voor de boer. De kennis over het beheer van natuur en landschap was afkomstig van vrijwilligers en uit vakbladen. De vrijwilligers als partij in een institutioneel arrangement maken deze arrangementen complexer. Natuur- en landschapsbeheer werd niet gezien als een belangrijke strategie om het inkomensrisico op een bedrijf te reduceren.

Het doel van hoofdstuk 6 was om een theoretisch en empirisch model te ontwikkelingen voor de analyse van beslissingen van individuele boeren om al dan niet natuur en landschap te beheren, hoeveel te beheren, en om al dan niet samen te werken. De motivatie om samen te werken volgt uit de mogelijkheid om transactiekosten te reduceren en het opbouwen van onderhandelingsmacht. Het model is toegepast op Nederlandse melkveebedrijven.

De reductie van de vaste transactiekosten maakt het voor boeren aantrekkelijker om een milieucoöperatie te vormen bij vaste prijzen voor het beheer natuur en landschap. Bij samenwerking veranderen de prijzen en daarmee de marginale kosten niet. Dit betekent dat een boer die al natuur en landschap beheerde voordat hij ging samenwerken zijn productie niet zal veranderen, echter zijn winst zal wel toenemen. Als de vraag niet langer prijs elastisch is (de prijs wordt endogeen) zal een toename in het beheer van natuur en landschap leiden tot lagere prijzen voor natuur en landschap. Indien een milieucoöperatie kan opereren als een monopolist heeft zij een betere onderhandelingsposititie waardoor er een teruggang is in het beheer van natuur en landschap, de prijzen stijgen en er minder boeren zijn die natuur en landschap beheren. Deze situatie kan nog steeds sociaal optimaal zijn in vergelijking met een situatie zonder

samenwerking omdat de reductie in de publieke transactiekosten door met één partij te samenwerken groter kunnen zijn dan bij samenwerken met veel partijen.

Het model in hoofdstuk 6 is een korte termijn model waardoor bijvoorbeeld veranderingen in technologie niet worden meegenomen. Verder is een geaggregeerde welvaartsanalyse niet mogelijk omdat het model de baten voor consumenten en publieke transactiekosten niet meeneemt. Ondanks beperkingen is het model in hoofdstuk 6 geschikt om het aanbod van natuur en landschap te bestuderen.

In hoofdstuk 7 wordt een algemeen overzicht gegeven van milieucoöperaties gericht op het aantal coöperaties, de geografische spreiding, het belang voor agrarisch grondgebruik, activiteiten en problemen. In 1999 waren er ongeveer 80 milieucoöperaties. Deze coöperaties hadden ongeveer 6600 boerleden/deelnemers en 1600 niet-boeren leden/deelnemers. Gemiddeld 6% van het totale grondgebruik in hun gebied was in gebruik bij de milieucoöperatie en de gemiddelde omvang was ongeveer 1600 ha. De meeste coöperaties waren actief in het noorden en westen van Nederland. In de regio's waar de milieucoöperaties actief waren was ongeveer 50% van de boeren lid of participant. Ongeveer 75% van de milieucoöperaties sloot overeenkomsten af met individuele boeren. Deze contracten liepen uiteen van het onderhouden van heggen tot randenbeheer en het toelaten van weidevogels of ganzen. De hoofdactiviteit van een milieucoöperatie was het beheer van inpure publieke goederen zoals natuur en landschap. Belangrijke diensten van milieucoöperaties waren het spreken met anderen namens de deelnemers/leden en het zijn van een belangengroep. Het gebrek aan financiële middelen, overheidsregelgeving en de beschikbare tijd waren de belangrijkste knelpunten voor de organisaties.

Vijf hoofdredenen voor het oprichten van een milieucoöperatie waren: (1) het omgaan met marktfalen; (2) het besparen op transactiekosten; (3) het opbouwen van marktmacht; (4) het vormen van een alternatief voor overheidsingrijpen; en (5) het tegengaan van *hold-up* problemen. Uit de enquête volgt dat deze redenen werden herkend als redenen voor de oprichting van een milieucoöperatie. Elementen van deze redenen zijn onder andere (in volgorde van belang): bijdragen aan het behoud van natuur en landschap; het behalen van een inkomen uit natuur en landschap, en beperkingen in bedrijfsmogelijkheden volgent uit de ontwikkeling van gebieden speciaal voor natuur en landschap.

De meerderheid van de milieucoöperaties in Nederland is georganiseerd als vereniging of coöperatie (ca. 70%). Dit betekent dat de meerderheid een club arrangement heeft. Een minderheid van de co-operaties is georganiseerd als stichting. Een club arrangement kan worden gedefinieerd als een groep mensen die vrijwillig samenwerken om gemeenschappelijke voordelen te behalen uit het delen van een of meer van de volgende zaken: productiekosten van activiteiten en diensten, gemeenschappelijke kenmerken van de deelnemers (bijvoorbeeld het boer zijn), of het gemeenschappelijk gebruik van een goed dat wordt gekarakteriseerd door de mogelijkheid om niet leden uit te sluiten. Uit de resultaten van een enquête onder milieucoöperaties volgt dat bij de meeste organisaties potentionele leden vrijwillig kiezen om lid te worden en dat de bevoegdheden van de leden worden gedelegeerd via stemrecht. Milieucoöperaties maken gebruik van uitsluitingsmechanismen waarbij niet-leden of niet betalers kunnen worden uitgesloten van het gebruik van de club. Hierbij moet echter worden opgemerkt dat het voor sommige activiteiten het moeilijk is om mensen uit te sluiten door het karakter van deze activiteiten.

Om een rechtspersoon te worden in Nederland moet de milieucoöperatie algemene regels en procedures volgen die van belang zijn voor rechtspersonen. Dit betekent dat de formele institutionele omgeving de organisatiestructuur te dele bepaald. Echter dit betekent niet dat het institutionele arrangement van alle milieucoöperaties gelijk is. Verschillen tussen coöperaties kunnen worden gevonden voor de doelen van de organisatie; de wijze van stemmen, lidmaatschapsgelden, type leden, etc.

De invloed van de informele institutionele omgeving als een argument voor het oprichten van milieucoöperatie speelde ook een rol. De door boeren gevoelde "Wensen van de samenleving" is gebruikt als referentieniveau voor de vraag naar natuur en landschap in een samenleving. Dit referentieniveau is gebruikt als proxy variabele voor de informele institutionele omgeving en speelde voor veel milieucoöperaties een rol.

Milieucoöperaties maken gebruik van algemene ontwerp principes om de problemen die volgen uit het falen van institutionele arrangementen tegen te gaan. Onderscheiden falen van contractuele arrangementen zijn: asymmetrische informatie (verborgen acties en verborgen informatie) en een gebrek aan geloofwaardige betrokkenheid en vertrouwen. Club organisatiefalen volgen onder andere uit een gebrek aan regels voor het delen van voorzieningen, niet efficiënte stemsystemen en falende uitsluitingsmechanismen. Deze problemen beïnvloeden de effectiviteit en efficiency van zichzelf organiserende en zichzelf besturende organisaties voor

het beheer van natuur en landschap. In dit onderzoek zijn aanwijzingen gevonden voor het gebruik van ontwerpprincipes door milieucoöperaties in de praktijk in Nederland:

- *Verborgen informatie*

  Verboren informatie kan worden tegengegaan door signaleringsmechanismen en screeningsmechanismen. Er wordt in de praktijk gebruik gemaakt van de ontwerpprincipes screening en siganlling.

- *Verborgen acties*

  Het probleem van verborgen acties kan worden tegengegaan door monitoring en incentive contracten. Een alternatief wordt gevormd door het vragen om het betalen van een waarborgsom. De enquête laat zien dat monitoren een belangrijke rol speelt bij milieucoöperaties. Er wordt minder aandacht besteed aan andere mogelijkheden.

- *Geloofwaardige betrokkenheid en vertrouwen*

  Geloofwaardige betrokkenheid en vertrouwen kunnen worden bevorderd door monitoring, gepaste sancties, mechanismen om conflicten op te lossen, reputatie en het onmogelijk maken van alternatieven. Uit het onderzoek volgt dat de meeste organisaties gebruikt maakt van gepaste sancties en monitoren. Verschillende mechanismen werden gebruikt voor het oplossen van conflicten. Door hun relatief jonge levensduur waren veel organisaties nog in ontwikkeling. Hierdoor zal het opbouwen van reputaties vaak nog niet goed mogelijk zijn geweest.

- *Club organisatie falen*

  Milieucoöperaties gebruiken uitsluitingsmechanismen waarbij niet leden of niet betalers kunnen worden uitgesloten. Deze mechanismen werken goed bij contracten met individuele boeren voor natuur- en landschapsbeheer. Uitsluiten van het zijn van een belangengroep is lastiger.

Samenvattend, de meeste milieucoöperaties maken gebruik van allerlei type ontwerp principes. Dit zal het mogelijk maken om om te gaan met verborgen informatie, verborgen acties en club organisatiefalen. Verder maakt het gebruik van ontwerp principes het mogelijk om geloofwaardige betrokkenheid te laten zien met betrekking tot het beheer van natuur en landschap.

RELATED PUBLICATIONS AND PAPERS

(selection)

Polman, N.B.P. and J.H.M. Peerlings (2002) *The role of transaction costs and bargaining power in wildlife and landscape services production: A micro-econometric model for Dutch dairy farms*. Paper presented at the Xth Congress of European Association of Agricultural Economists (EAAE), Zaragoza, August 28-31.

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Polman, N.B.P. and L.H.G. Slangen (2000) *Farmers' clubs for preserving wildlife and landscape: the importance of the institutional environment.* Poster presented at XXIV International Association of Agricultural Economists (IAAE) conference in Berlin, August 13-18.

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Polman, N.B.P and L.H.G. Slangen (1999) *Wildlife and Landscape Preservation: Incomplete Contracting.* Paper presented at the IXth European Association of Agricultural Economists (EAAE), Warsaw, August 24-28.

CURRICULUM VITAE

Nicolaas Bernardus Petrus Polman is geboren op 7 maart 1969 te Westervoort. In 1988 heeft hij zijn diploma Voorbereidend Wetenschappelijk Onderwijs (VWO) behaald aan het Liemers College te Zevenaar. Hierna begon hij met de studierichting Agrarische Economie aan de toenmalige Landbouwuniversiteit in Wageningen. In 1994 studeerde hij af in de vakken Agrarisch Recht en Algemene Agrarische Economie. Tijdens zijn studie verbleef hij 4 maanden aan de Christian-Albrechts Universität te Kiel. Na zijn studie en militaire dienst heeft hij gewerkt als (toegevoegd) onderzoeker bij de leerstoelgroep Agrarische Economie en Plattelandsbeleid van Wageningen Universiteit en het Landbouw-Economisch Instituut (LEI) te Den Haag.

In januari 1998 volgde een aanstelling als Assistent In Opleiding bij de leerstoelgroep Agrarische Economie en Plattelandsbeleid op het project "Optimal Incentive Methods to Combine Agriculture with Preservation of Wildlife and Landscape" waarvan dit proefschrift het resultaat is. In 2000 behaalde hij het diploma van het landelijk Netwerk Algemene en Kwantitatieve Economie (NAKE) en het Mansholt-certificaat van de Mansholt Graduate School van Wageningen Universiteit.

Sinds mei 2002 is Nico Polman verbonden als toegevoegd onderzoeker aan de leerstoelgroep Agrarische Economie en Plattelandsbeleid van Wageningen Universiteit.

ABSTRACT

This thesis focused on land use in which agriculture is combined with wildlife and landscape management. The objective of the study was to analyse the design of contractual arrangements for wildlife and landscape management by farmers. An important method used in this thesis was a literary approach combined with statistical tools using data from mail surveys. The literary approach is based on theory and makes use of close reasoning. Other methods used were formal models concerning the decision to contract and the consequences of contracting at the farm level. This thesis has concentrated on the supply side, especially on the institutional organisation. The research focussed on institutional aspects of wildlife and landscape management and contributed to the study of wildlife and landscape because it helps to establish a link between supply and demand. This study has shown that contractual arrangements and environmental co-operatives are suitable arrangements for the provision of wildlife and landscape, and that they deserve attention from the viewpoint of empirical science as well as of policy makers.

Druk: Grafisch Bedrijf Ponsen & Looijen bv, Wageningen