

APPLYING THE INSTITUTIONS OF SUSTAINABILITY FRAMEWORK TO THE CASE OF AGRICULTURAL SOIL CONSERVATION

Katrin Prager

Humboldt-Universität zu Berlin, Faculty of Agriculture and Horticulture, Division of Resource Economics, Philippstr. 13, 10099 Berlin, Germany, PhD, katrin.prager@agrar.hu-berlin.de.

ABSTRACT

The Institutions of Sustainability (IoS) Framework is a coherent framework that takes into account the interdependencies between ecological and social systems. It has been applied in previous studies and proven to be a useful tool for the analysis of issues in agricultural economics and resource management centred on human-nature interaction. However, previous contributions have not made explicit how to create the link between the analytical framework and practical empirical research, i.e. how to operationalise the IoS framework, how to ‘unpack’ action arenas, and how to derive a step by step analysis of the institutional arrangements. The paper explains the application of this framework using the example of agricultural soil degradation and soil conservation policy. We discuss several challenges that occurred when the framework was utilised to guide case study research. The paper aims to assist scholars from different disciplines in the application of the IoS framework to undertake a systematic institutional analysis.

Keywords: Institutions of Sustainability, analytical framework, institutional analysis, action arena, soil conservation, nature-society relationship

INTRODUCTION

According to the results of the “Global Assessment of Human-induced Soil Degradation” (GLASOD) (Oldeman et al. 1990), soil degradation is a threat to almost all countries in the world. A report on environmental indicators of agriculture shows that in certain OECD countries more than 10% of agricultural land falls within the risk class of ‘high/severe risk for soil degradation’ (OECD 2001b). According to the EU Thematic Strategy on the protection of soils (CEC 2006), the greatest threats to soils in Europe comprise erosion, decline in organic matter, soil contamination, soil compaction, decline in soil biodiversity, salinisation as well as floods and landslides. Despite increased awareness and years of effort and investment made for prevention or mitigation, the problem of soil degradation persists.

Agricultural activities are one of the main factors contributing to soil degradation (Boardman et al. 2003; Helming et al. 2006). The impact of agricultural and other land use activities depends on climatic conditions, slope and soil type, and is sometimes a matter of timing and precise application of a practice or technology.

Soil conservation issues and related agri-environmental policies have historically been addressed separately from different disciplinary perspectives which have often led to inadequate results because approaches were not sufficiently integrated and gaps emerged. For example, even when specific farming practices are advocated these often are not linked to the incentive structures that would motivate farmers to introduce such changes (Drake et al. 1999; Röhm and Dabbert 1999; Uri 1999). Regulations may be inapplicable because they lack political support e.g. due to strong resistance from stakeholders (Ervin and Ervin 1982; Eggers et al. 2003; Eggers 2005), while

there may be limited take up of voluntary approaches causing them to become ineffective (e.g., OECD 2001a). No single approach was able to sufficiently explain why some soil conservation measures are effective while others fail. Instead, soil conservation is an issue that requires a coherent approach that encompasses social systems as well as natural systems because both may substantially affect institutional change and institutional performance.

Consequently, an analytical framework for institutional and policy analysis is needed to analyse soil conservation issues. We chose Hagedorn's (2008) analytical framework – Institutions of Sustainability (IoS) – and adapted it to the specific context of soil conservation practices and policies. The framework integrates the properties of transactions, characteristics of actors, institutions and governance structures and displays their relevance in action arenas. In several applications, this framework has proved to be a useful analytical tool to identify particular features of institutions that are supportive (or detrimental) to the sustainable use of natural resources (Gatzweiler and Hagedorn 2003; Penov et al. 2003; Schleyer 2004; Theesfeld 2005). Ehlers (2008) modified the early framework of Hagedorn et al. (2002) to investigate when, under which conditions, which combinations of incentives and disincentives came into effect in the case of farmers' uptake of biogas production.

However, scholars often do not find the operationalisation of the framework straightforward. Beyond recognising the IoS as an adequate analytical framework they are faced with many choices regarding the relevant transaction(s), the definition of the action arena(s) and a suitable methodology. The aim of the paper is to assist scholars from different backgrounds to apply the IoS by using soil degradation as an example where the framework was applied.

Hence, the rationale for the paper is to advance methodological development in the institutional analysis of resource management and, ultimately, contribute to the mitigation of soil degradation by providing insights on the mechanisms at play in the complex issue of agricultural soil conservation.

The paper is structured as follows. First, we provide a rationale for the application of the IoS framework as an institutional approach to soil degradation and contrast the chosen framework with other concepts. Second, we will show how the framework can be operationalised, what choices must be made and what methods we derived from the framework. This process will be illustrated with examples from ten case studies, to which the framework and methodology have been applied.¹ Finally, the paper discusses the merits of the approach and points out challenges.

BACKGROUND AND THEORY

Soil degradation as an institutional problem

Soil degradation is a natural process on many sites on earth, but it is globally aggravated or even caused by human use of soil (Schachtschabel et al. 1992). Thus, the rate of degradation is a result of the natural conditions of the whole soil system combined with human use of soils. We regard the issue of soil degradation as a problem of institutional change, i.e. changes in the social system due to economic and technological drivers and natural impacts. The changes in the social

¹ The case studies were located in Germany, the Czech Republic, Bulgaria, Spain, Greece, Belgium, the UK, Denmark, Italy, and France. The case studies were carried out as part of the EU project "Sustainable Agriculture and Soil Conservation (SoCo)" (Joint Research Centre 2009)

system are closely linked to changes in the ecological system, which are due to natural and physical drivers and human impact.

Soil management in the EU is very much in the hands of private individuals. Practices employed by land users are determined largely by the economic variables reflected in the respective production functions, such as soil fertility, and prices and quantities of inputs and outputs. These variables are in turn predominantly driven by technological factors and economic forces. As an example for an economic driver, rising market prices cause farmers to grow more maize. They may take land under cultivation that was previously grassland. This affects the biodiversity and water quality of the area. An example for a technological driver is the increasing size of machinery such as tractors and harvesters. Larger machines can save work time but at the same time impact negatively on soil structure and soil biodiversity.

Practices of farmers and other land users are also influenced by a wide range of – often interrelated – institutions and policies. Although usually considered a second order driver of farming practices, policies can determine crop structure and farming practices. Examples under the Common Agricultural Policy (CAP) are set-aside schemes and incentives for growing specific crops, e.g., for bioenergy or vineyards. Yet other policies prohibit certain soil degrading farming practices in sensitive areas, such as Nitrate Vulnerable Zones to protect drinking water catchments.

Achieving sustainability is increasingly recognised as an issue of institutional change and institutional innovation. As a consequence there is a growing awareness of the analytical limits of concepts which frame problems within a ‘market-or-state’ dichotomy (Ostrom 1990). This led to the development of a framework for the analysis of ‘Institutions of Sustainability’ (IoS) (Hagedorn et al. 2002; Hagedorn 2008). It is inspired by the Institutional Analysis and Development framework (IAD) by Elinor Ostrom (2005).

Different concepts have been developed that try to integrate the social and the ecological system. Although not proposed as an analytical framework to guide research, Berkes (2006) suggests a framework adapted from the Millennium Ecosystem Assessment (MA 2003) which captures levels of political and social organisation and levels of ecosystem organisation, sketching cross-scale governance and the integrated system of people and resources. We consider this as too rough a framework to guide research as the components of the social-ecological system are insufficiently specified, e.g., actors, institutions and transactions are only implicitly included.

The International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD 2009, Hurni et al. 2008) uses a conceptual framework similar to the IoS and may be an option to guide research (see Figure 5 in appendix). The IAASTD conceptual framework for the assessment of Agricultural Knowledge, Science and Technology (AKST) – as does the IoS framework – differentiates between the social system (political, economic, social and cultural contexts) and the ecological system (ecosystems, agricultural and production systems). However, there is duplication in the elements of the IAASTD framework (e.g. labour, policy, technology, environment/ climate) and the structure appears less conducive to guide research. As we place the focus on institutional analysis we perceive the IoS framework to be the more suitable framework.

The Institutions of Sustainability (IoS) framework – Adaptation to soil conservation

We have chosen the IoS framework in order to capture the complexity of determinants affecting soil degradation and soil conservation. The IoS framework uses a metatheoretic language, i.e. a multilevel taxonomy of the underlying components of the situations human actors face (see

Ostrom 2005; Hagedorn 2008). Therefore, it has the capacity to provide a systematic frame for analysing and understanding the diverse issues and relationships that play a role in soil degradation and conservation. It also serves to integrate the diverse research approaches deriving from soil science, farm economics, political science, and institutional economics.

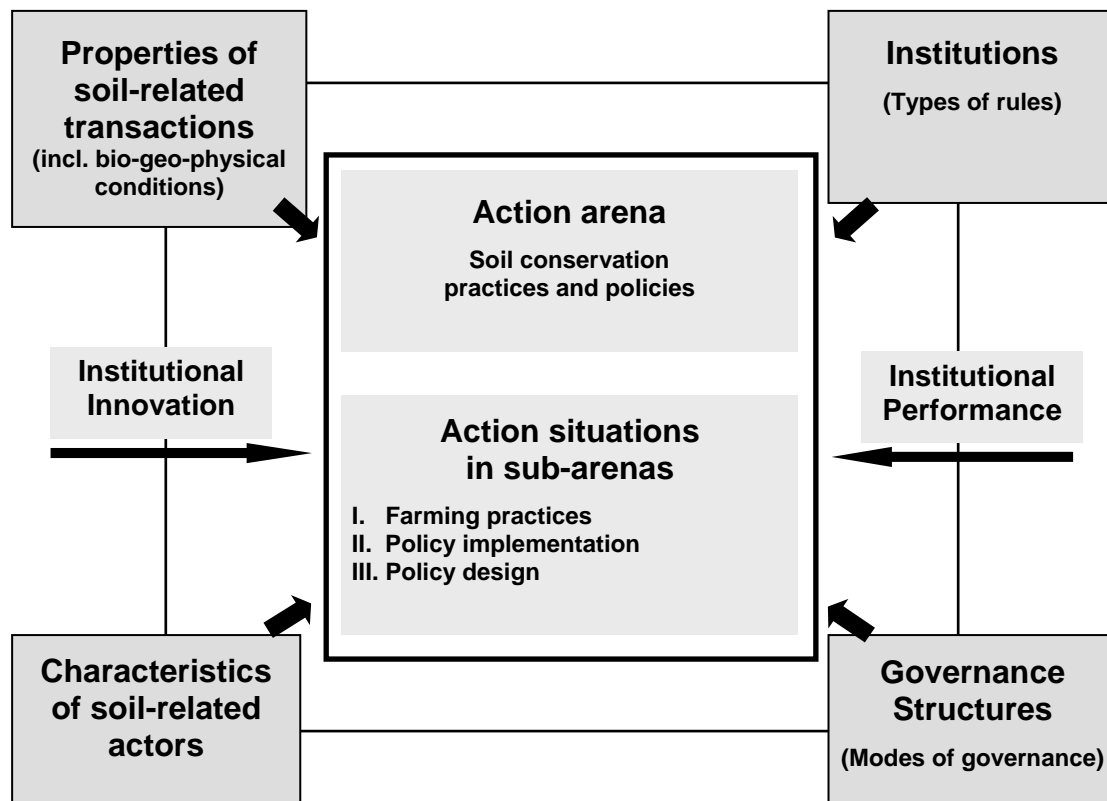


Figure 1: The IoS Framework as adapted for the analysis of soil conservation policy (source: adapted and extended from Hagedorn et al. 2002; Hagedorn 2008)

Agricultural practices, and those of other land users, can both increase or mitigate soil degradation. Soil degradation and soil conservation depend on the choices actors make, especially in three interrelated action arenas² (see Figure 1). As the overall action arena we defined “Soil conservation practices and policies”. The action situations relevant for soil conservation and degradation take place in this arena. More precisely, these action situations are taking place in three sub-arenas. The sub-arenas are delineated:

- 1) at the *farm level* (e.g., a farmer deciding to adopt a particular soil conservation practice),
- 2) at the *level of policy implementation* (e.g., agricultural or environmental administrations implementing a particular procedure to monitor farmers’ compliance with a restriction in land use), and

² In an action arena, “... participants and an action situation interact as they are affected by exogenous variables [...] and produce outcomes that in turn affect the participants and the action situation” (Ostrom 2005: 13). An action situation occurs, “whenever two or more individuals are faced with a set of potential actions that jointly produce outcomes...” (ibid: 32).

3) at the *level of policy design* (e.g., policy makers at EU, national, or regional level defining concrete restrictions in land use in nature protection zones or determining the set of agri-environmental measures to be offered in a region).

Four key exogenous factors are identified by the IoS that influence every action situation by shaping the situational context and, largely, determine its outcome: 1) the *properties of the transactions* that are induced or prevented in the action situation (including the bio-geophysical conditions), 2) the *characteristics of the actors* involved in the action situation, 3) the *institutions* (i.e., sets of rules or property rights), and 4) the *governance structures* in place to make the rules effective. Which institutions and governance structures emerge depends on the properties of transactions and the characteristics of actors.

The four exogenous factors are interconnected and also influence each other. The transactions related to soil determine what institutions emerge. The institutions influence what type of governance structures are chosen so that rules become rules-in-use. Actors influence transactions, institutions and governance structures but are themselves subject to institutions and governance structures at the same time.

SPECIFICATION OF THE IOS FRAMEWORK

The following section explains how we operationalised the framework in order to answer our research questions relating to soil conservation and degradation. The key research questions were: (1) How should policy measures be designed to encourage farmers to adopt effective soil conservation practices? (2) Why are some soil conservation policies effective while others fail?

We aim to provide guidance for other research in the field of human-nature interaction by using soil degradation as an example to illustrate our successive steps. With reference to the analytical framework (Figure 1) we specify and describe the areas that are relevant for the empirical analysis in more detail. These areas concern (1) policies and their link to institutions, governance structures and technical measures, (2) the action situation in sub-arenas, (3) examples for soil-related transactions, and (4) soil-related actors.

Relationship between policies, institutions, governance structures and technical measures

The action arena ‘Soil conservation practices and policies’ comprises all practices and policies that apply to a case study area directly or indirectly i.e., that shape soil status and the threats originating from farming activities. However, both terms, practices and policies, are very broad. In order to operationalise the framework it is necessary to be more specific as to what the two terms mean and how they are linked.

Farming practices are a specific way of growing crops and fodder. They comprise, for example, specific tillage types, the amount of fertiliser applied, the machinery used, or specific time spans for work steps. Technologies can be a part of a farming practice. Technical measures for soil conservation, more specifically, are either directly related to farming practices (such as reduced tillage) or address soil conservation in another way (such as drainage of a field or planting tree strips). Hence, practices or technical measures address the technical, on-the-ground aspects of soil degradation. They are different to policy measures for soil conservation.

The term policies (or policy measures) may refer to different ways of political means to impact on actors’ behaviour. We distinguished policies in terms of the impact they have on farmers’ choices. With reference to the IoS framework we conceive that policies affect institutions and

instruments, and both are implemented via governance structures. The logic of how policy measures lead to changes in technical measures and farming practices by way of changing either institutions, instruments, or governance structures is shown in Figure 2.

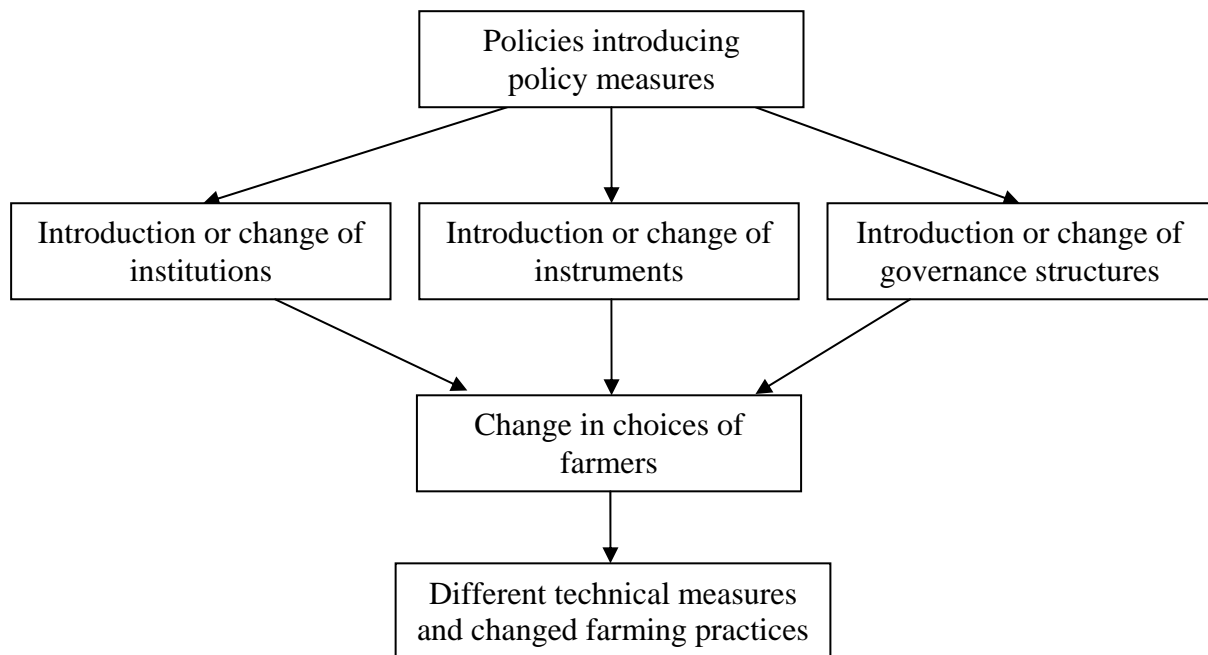


Figure 2: The logic of how policy measures lead to technical measures (figure by the author)

Some policy measures may result in a change in the set of rules, e.g. the amendment of GAEC³ standards under cross compliance which impose restrictions on soil degrading practices. These rules are set and require implementation. The implementation of rules is organised via various governance structures intended to secure the compliance of actors with the rules set out in the policies. There are also policies which may result in the change of the governance structures needed to implement a particular policy measure, for example, the policy may require the establishment of a new agency or implementation authority.

Another way of impacting on actor's choices is via instruments that directly impact on the behaviour of actors. Instruments are means of direct intervention to achieve defined ends, e.g. agri-environmental schemes offering the farmer payments for certain actions. Instruments also need governance structures to implement them and to make them effective.

Institutions are sets of rules regularising actors' behaviour. They regularise the distribution of (de-facto) property rights over relevant natural resources among actors and thus imply particular cost and benefit streams that individual actors or groups of actors can reasonably expect in an action situation. For example, since agri-environmental schemes rely on voluntary contracting and payments to farmers for environmental services, the definition of farmers' property rights over productive resources and the use of the environment are of central importance. An important part of the consideration are property rights (disposition rights to natural goods - or attributes of nature) that the various activities and associated transactions impinge upon as well as the transaction costs associated with their implementation.

³ GAEC = Good Agricultural and Environmental Condition

The governance structures are organisational solutions to make rules effective. They affect the soil status by either addressing soil status directly or by addressing other environmental issues but benefiting soils at the same time. Governance structures include markets, hierarchies, hybrid forms, planning processes, knowledge and information systems and networks, monitoring infrastructures, procedures for conflict resolution and distribution of costs, and incentives to promote innovation and learning. Governance structures may be public or private forms of organisation.

Action arenas differentiated by fields and scales

Numerous action situations regarding soil degradation and conservation may occur in different sub-arenas. Action situations in relation to ‘Soil Conservation Practices and Policies’ are often closely interrelated. This means that the outcome or result of an activity by an actor or a group of actors in one action situation may restrict (or allow for) the choices other actors have in other situations. For example, both the nature of the bundle of available agri-environmental measures (determined at the level of policy design) and the administrative procedures used to implement these measures influences a farmer’s decision as to whether or not to adopt any of the agri-environmental measures available.

Sub-arenas, with concrete action situations, that apply to different geographical (and usually administrative) scales can be identified within the overall action arena: global, EU, national, regional, local, and farm level. As not all components of the framework can be investigated with the same level of detail due to limited resources and time, a choice must be made.

We limited the levels under investigation for the case studies in the following way: for policy design, EU policies were assumed as given and the focus was rather placed on policy design at the national and regional levels (depending on whether the case was located in a central or federal member state). For policy implementation, the regional and local levels were most relevant. For the arena of farming practices, we chose the local and the farm levels because they held the greatest interest.

Further, while the action arena ‘Soil Conservation Practices and Policies’ was at the centre of our interest, it is closely interrelated with action situations in other action arenas. These include other policy fields that do not aim at soil conservation, but have a substantial impact on soil conservation, or contradict or reduce the effects of soil conservation policies. Examples are the greater part of the CAP which does not target soil quality but has a significant impact on it, and national policies that foster irrigation but may lead to consequences including salinisation. Environmental legislation that focuses on the protection of other natural resources, such as water and air, often contributes to the protection of soil. For example, the substantive body of EU legislation on waste disposal and management is obviously linked to soil conservation. Importantly so too are many water, biodiversity, industrial pollution, and some climate and air pollution policies. Due to time limits, not all of these policies could be included in the investigation, but some main actors’ relationships and policy linkages across fields and scales were taken into account.

Properties of soil-related transactions

The term ‘transaction’ is used here in accordance with the definition provided by Williamson (1985: 1): “A transaction occurs when a good or service is transferred across a technologically separable interface. One stage of activity terminates and another begins.” Transactions can

benefit or deteriorate the soil status. Examples are the pollutions of soils by over-applying nitrate fertiliser or avoiding soil compaction by the use of wide tyres.

The properties of transactions can vary with respect to the degree of rivalry, excludability, asset specificity, separability or jointness, frequency of transaction, uncertainty of its implications, complexity and heterogeneity of its associated environmental problems, legitimacy, etc. For example, a row crop such as maize is associated with a higher risk of soil erosion because soil is uncovered for extended periods of time and water can gain velocity when flowing along the rows. This negative effect cannot be separated from growing maize. The frequency of the transaction is once per year, as maize is planted in late spring. The implications of the transaction show an uncertainty as the degree of erosion depends on precipitation and winds.

New technologies and economic drivers often lead to changes in the properties of transactions. For example, modern irrigation technologies may be able to avoid or reduce salinisation of soils. Reduced tillage operations that become feasible because equipment was adapted can reduce erosion. Mulching increases the content of organic matter in the soil.

Soil-related actors

Actors involved in the action arena ‘Soil Conservation Practices and Policies’ comprise mainly (groups of) farmers, environmentalists, conservationists, other civil society stakeholders, as well as regulators and policy makers at various levels of societal organisation. These individual actors or groups of actors follow their own environmental, income, or budgetary objectives, and they may have different values and beliefs. Which actor’s objectives matter in an action situation depends, among other things, on their lobbying power, networks and social capital. This also includes farmers simply managing their own land since their choices usually affect other actors, e.g., by causing externalities.

OPERATIONALISATION AND ANALYTICAL STEPS

This section shows how we “zoomed in” the parts of the framework and how we unpacked particular action situations in order to analyse them. This is necessary because the action situation is taken as the focal unit of analysis. Part 1 of the analysis is concerned with the soils and farming practices (agri-environmental analysis), while Part 2 focuses on the actors and policies (institutional and policy analysis). Each analysis was divided into steps indicating the clusters of research activities. These steps are described and difficulties with overlap are discussed.

Agri-environmental analysis

The focus of the agri-environmental analysis is on the properties of soil-related transactions, i.e. the biophysical conditions or characteristics of the resource ‘soil’, and the action situation “farming practices” (Figure 3). As a result of this analysis, a common understanding is provided on how soil degradation (a soil-related transaction) is interrelated with farming practices.

Agricultural land management usually encompasses all tillage and planting operations, cropping practices, fertiliser, lime, irrigation, herbicide, and insecticide application, and other treatments conducted on or applied to a soil for the production of plants. In this analysis, soil conservation

refers to all those soil management activities that help to prevent or reverse the various forms of soil degradation.

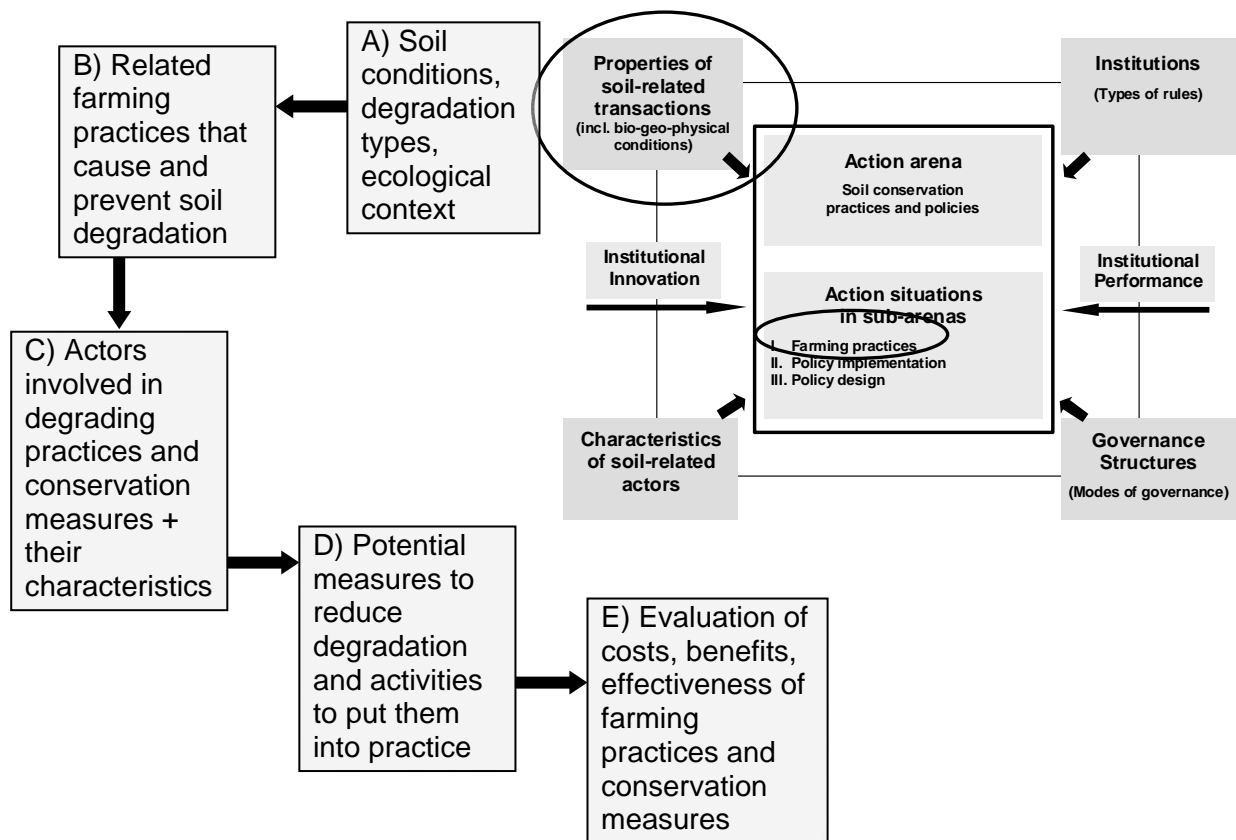


Figure 3: Steps in the agri-environmental analysis (figure by the author)

The analysis draws on the work of different disciplines when relating soil degradation and corresponding driving forces (i.e. farming practices), based on a concise procedure for describing environmental conditions (soil and climate) and degradation processes. In a first step, the current soil conditions (A), major soil degradation issues and the driving forces behind them are described. This procedure includes also the most common farming practices (B), since one of the main factors for soil degradation is related to non-adapted land use. Understanding the causes of soil degradation as well as incentives and constraints for soil conservation requires information about the actors. The most important actors are farmers with their preferences, action resources, attitudes, and perceptions (C). After this, soil conservation measures are described and analysed with regard to their practicability (D). Finally, the existing and/or suggested soil conservation practices are evaluated from an economic, social and ecological viewpoint based on defined evaluative criteria (E). These steps are compiled in Figure 3.

Note that step C (actors and their characteristics), which is a logical part of the agri-environmental analysis, is also an integral part of the institutional and policy analysis. In the latter analysis, actors are subject of the research steps concerning ‘actors’ in Figure 4 (steps A to D). For practical and organisational reasons the research concerning actors was undertaken as part of the institutional and policy analysis and hence is further detailed in Section 0.

Analysis of institutions and policies

The institutional and policy analysis focuses on the ‘characteristics of the soil-related actors’, the action situations in the sub-arenas II ‘policy implementation’, and III ‘policy design’. Simultaneously, the analysis emphasises the links to sub-arena I ‘farming practices’ (see Figure 4).

For unpacking the action arenas into research steps, the analysis starts with the two central elements, actors and policies. As in any action situation, the structure of the situation can be described and analysed by using a common set of variables (Ostrom 2005: 32; 187-192):

- the set of participants
- the positions to be fulfilled by participants
- the potential outcomes
- a set of allowable actions and the function that maps actions into realised outcomes
- the control that an individual has in regard to this function
- the information available to participants about actions and outcomes and their linkages
- the costs and benefits – which serve as incentives and deterrents – assigned to actions and outcomes.

These variables are reflected in the research steps conducted for the actor and policy analysis but also link to research concerning the choice of farming practices. For the actor analysis, soil related actors need to be identified (A) in a first step, and the position of the most relevant actors need to be described. Actors are classified according to groups of actors representing the organisation they belong to, the administrative level they act at and what role they play in policy implementation (B). Information of the actor’s characteristics such as interests, knowledge, capacities, resources and networks (C) is complemented by information on their attitudes and perceptions (D). Interviews can reveal the actors’ perceptions, e.g. their perception of the severity of soil degradation, and their perception of policy measures in terms of their effectiveness, costs and benefits. Actors’ perceptions and values determine their objectives which will play out in certain choices of actions and behaviour (E). This process may, for example, materialise in policies, rules and their enforcement through governance structures, or result in a farmer’s adoption of soil conservation measures.

The second central element is the policy measures that are relevant to soil conservation (Figure 4, right hand side). The policy measures that are available or apply in the case study area need to be identified (F) and described. As a reminder, measures are differentiated as *technical measures* and *policy measures*. The description lists the policies’ objectives, links to other environmental policies as well as incompatible objectives (G). Policies create or affect *institutions* (sets of rules) and *instruments* (direct interventions) (H). To implement these rules and instruments, governance structures are required that enforce the compliance of actors with the rules set out in the policies (I). They can be based either on knowledge, information and monitoring, or on enforcement through command-and-control mechanism and sanctions. A further aspect to be considered here is the interplay between policy design and implementation. Finally, policies and their implementation lead to outcomes (J). Assessment criteria need to be defined in order to evaluate policy measures and to identify implementation deficits. Possible criteria are effectiveness and efficiency.

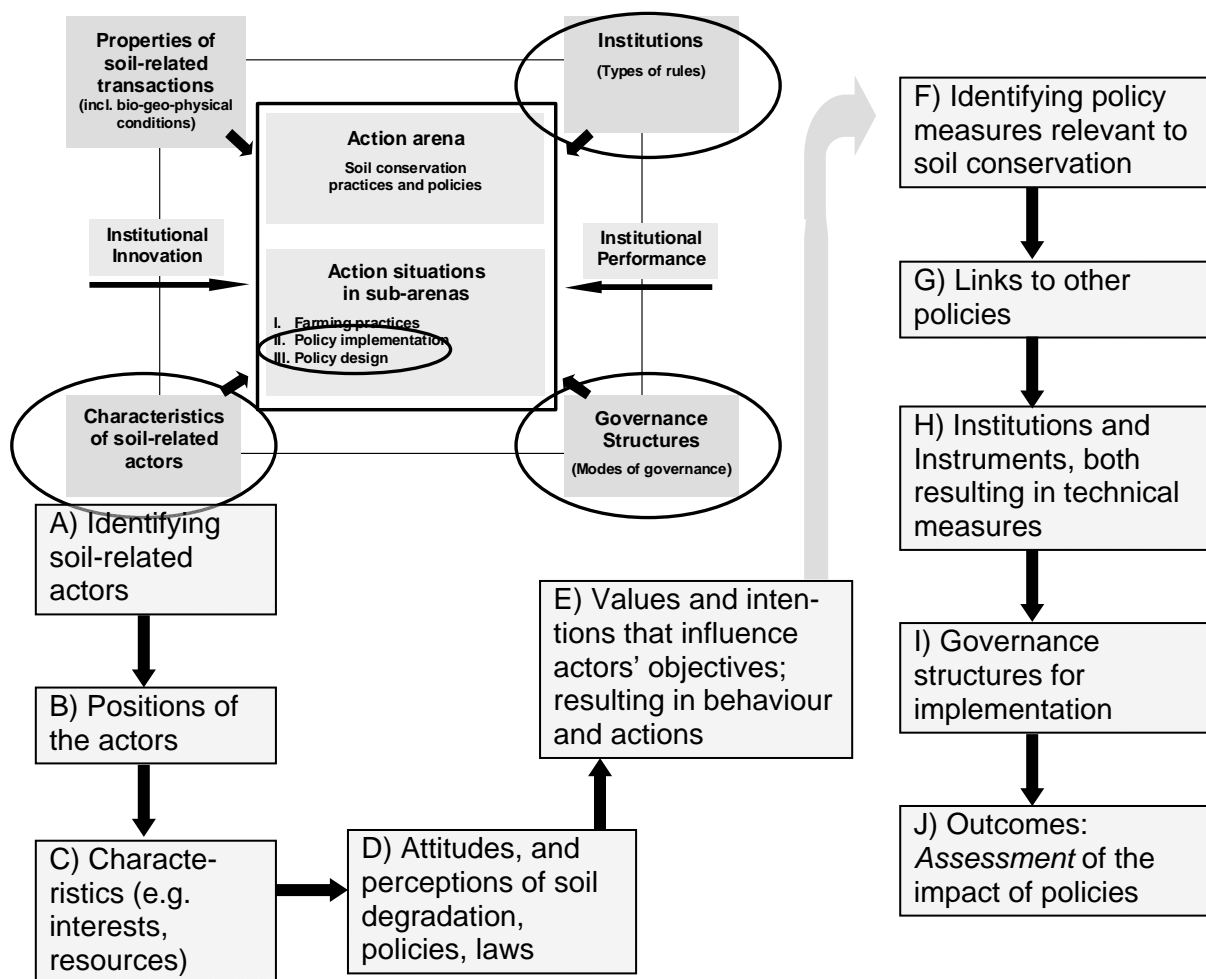


Figure 4: Steps in the institutional and policy analysis (figure by the author)

Deriving a methodology for data collection

The methodology derived from the framework to gather the necessary data for both, the agri-environmental analysis and the institutional and policy analysis, included three parts. Part 1 was a literature and document review. Part 2 concerned expert interviews to obtain data on soils and farming practices. Part 3 referred to interviews with stakeholders to compile primary data.

Part 1

For the literature and document review on the example of soil conservation we could draw on scientific literature relating to soil conservation policies and access legal documents such as laws, regulations, directives, decrees, procedural orders, and reports on legal disputes. In addition, (regional) statistical information as well as policy, administrative, evaluation, and research reports, e.g., mid-term evaluations of the 2000-2006 Rural Development Programmes were reviewed.

Part 2

For the agri-environmental analysis data and information on research steps A, B, C, and E (Figure 3) was gathered from scientific experts. Data gathering was conducted by means of

expert interviews with soil and farming practices experts based on a survey form (a detailed Excel questionnaire). Between one and three experts (per case study) helped to complete the survey form. Data and information was compiled regarding natural characteristics (soil types, landscapes, and climate); main soil degradation types; land use/farming practices; current and potential soil conservation measures. Not all information requirements could be fulfilled this way. This (mainly) quantitative data was qualitatively validated by findings from the stakeholder survey (see Part 3).

The subsequent analysis of the agri-environmental data produced information on the following aspects:

1. The characteristics of the technical measure, where it is currently applied and under what circumstances.
2. The measure's potential, i.e. what the measure offers specifically in terms of soil protection, its specific objectives and targets, and the measure's potential impact on soil degradation issues.
3. The technical feasibility, which gives an indication of whether the measure is already widely used, what conditions and characteristics enable or disrupt use. It also gives an indication of how broadly applicable to farming practices this might be i.e. specific types or styles of farming practice, specific regions, localities, as well as the likely scale and scope of the potential application.
4. The revenue and costs associated with implementing the measure in terms of start up and maintenance (where possible in monetary terms, or qualitative description).
5. The constraints (social, environmental, economic) which may result from the application of the measure i.e. those already observed or hypothetical based on expert knowledge.

To illustrate the type of information and linkages produced by the analysis, we provide an example. A summarised result for a case study reads as follows: "In the case study area Uckermark (Germany) the soils of type Luvisol show high erosion rates under rapeseed due to the high vulnerability of soils during the seeding season and the fine seedbed needed. However, farmers grow this crop because it is highly profitable. Conservation measures include mulching tillage, which is adopted by some farmers, while others are reluctant because this technique requires investments in special machinery."

Part 3

A stakeholder survey was carried out to generate primary quantitative and qualitative data. Institutional analysis often lacks sufficient data to link institutional structures to performance, or examine institutional choice and change. International comparable time-series or cross-section data on decision-making in soil conservation policy and the institutional and environmental performance simply do not exist. Although precise data on decision-making structures, public transaction costs, and environmental utility losses could probably be collected, it would be costly in terms of time and resources (Saleth and Dinar 2004: 124).

To overcome these limitations, we used stakeholders' perceptions and preferences as a data basis for the empirical analysis of institutional choice, institutional performance, and institutional change. Using such data is common in institutional analysis (see the detailed discussion in Saleth and Dinar 2004: 125-153) and has the principal advantage that the institutional and performance indicators are derived within the same analytical context. Stakeholders do not only assess the institutional structures but also their performance. Such data is subjective, but theoretically

consistent with the concept of bounded rationality which refers to human behaviour that is intentionally rational but only to a limited extent (Beckmann et al. 2009).

After identification of the relevant actors we used the action arenas to classify them. The intention was to include relevant actor groups who are or should be directly or indirectly involved in soil conservation efforts or policy. The classification produced groups of actors that may be active in any of the three sub-arenas: (I) Farming practices; (II) Policy implementation; or (III) Policy design.

The participants in each action arena are subdivided into two categories. The first category includes actors that are part of an organisation with a hierarchical or bureaucratic structure (inside hierarchies). The second category includes actors that are part of groups or organisations in civil society (outside hierarchies). The classification is shown in Table 1. Note that we assigned the local and regional level to policy implementation activities, while policy design is assigned to the national level. Some organisations or groups appear twice because they may be active in several action arenas and at different levels.

Table 1: Categories of soil related actors and selected examples (based on a compilation by the author, Konrad Hagedorn, Catherine Bowyer, and Tamsin Cooper)

	Farming practices	Policy implementation	Policy design
Actors that are part of an organisation with a hierarchical or bureaucratic structure	Inside hierarchies: farms and firms	Inside hierarchies: administration and regulating agencies	Inside hierarchies: government and parliament
	<ul style="list-style-type: none"> • Individual farmers e.g. family farms • Farming companies e.g. cooperatives 	<ul style="list-style-type: none"> • Environmental agencies • Nature conservation agencies • Local/ regional government and agencies involved in local level policy delivery • Authorities responsible for implementation of rural development policies 	<ul style="list-style-type: none"> • Ministry of Agriculture • Ministry of the Environment • National or federal agencies or institutes dealing with agriculture or the environment
Actors that are part of groups or organisations in civil society	Outside hierarchies: e.g. advisors	Outside hierarchies: e.g., associations	Outside hierarchies: e.g., pressure groups
	<ul style="list-style-type: none"> • Agricultural associations • Farm extension or advisory services, on-farm advisors 	<ul style="list-style-type: none"> • Environmental/ Nature conservation NGOs • Monitoring bodies e.g. rural monitoring organisations • Land consolidation organisations • Irrigation associations • Research institutes 	<ul style="list-style-type: none"> • Farmers' Unions • Environmental associations • The policy evaluation community, policy experts • Privatisation agencies and land funds

Questionnaire No 1

Questionnaire No 2

Questionnaire No 3

The resulting questionnaires were targeted at farmers (Questionnaire 1), administrative and governmental actors (Questionnaire 2), and civil society actors operating outside public bureaucracies (Questionnaire 3). Table 1 indicates which questionnaire was used for which actor

group (differently framed). The questionnaires had a modular structure allowing them to be adjusted to the position and expertise of the respective interviewee, e.g. by using either the module on policy design or the module on enforcement and sanctioning.

The subsequent analysis produced information on the following aspects:

- A typology based on the analysis of all available and applied soil conservation policies in the case study area, according to the way they impact on farmers' behaviour (institution, instrument, governance structure) as well as according to the way they may elicit a response as regulatory measure, incentive-based measure, or information and capacity building measure.
- A description of the way each policy is designed, implemented at the administrative level, and delivered to farmers.
- The drivers for uptake of or compliance with a policy measure.
- The technical measures prescribed by the policy measure.
- Which mechanisms are available for control, enforcement, monitoring and evaluation of the policy measure.
- An assessment of the outcomes of a policy measure and its effectiveness, the drivers for the outcomes, as well as constraints to achieving full potential.

An example for the type of information produced by this analysis reads as follows: "The German Soil Protection Law is a regulatory measure. It was passed in 1999 following several years of discussion between stakeholders at the national level and has been amended several times since. The law has a broad soil conservation scope. Agricultural soil conservation is dealt with in a single paragraph which prescribes the Code of Good Agricultural Practice in general terms. The Code does not include any specific technical measures. The law is a formal institution that is lacking the governance structures to make it a rule-in-use. Authorities generally assume farmers' compliance with the Code. There is no control mechanism and no case of legal enforcement has been evidenced. Since there is no monitoring mechanism, an evaluation of the outcome of the policy measure is not possible. However, according to stakeholders' perception the law provides a baseline for the protection of agricultural soils."

CONCLUSION

The Institutions of Sustainability (IoS) framework was adapted to the specific context of soil conservation policy in order to take into account agri-environmental as well as policy and institutional factors influencing soil conservation. The aim was to show how this analytical framework can be operationalised, action arenas unpacked and a methodology developed to carry out a systematic institutional analysis.

The IoS framework was well suited to provide a common framework for the analysis of ten substantially different case studies because it included all relevant elements to answer the soil-specific research questions. The core elements were present in all case studies, despite their different regulatory, environmental, social, institutional and economic context. By specifying the four main exogenous factors and developing categories for their analysis it was possible to generate comparable results.

For example, the classification of actors was developed based on the action arenas. The generic categories provided a general pattern that could be applied in each case study. The classification

of actors allowed to take the specific context into account and to adapt the groups of actors that were relevant to interview for the particular case. At the same time, it required experienced interviewers that have an understanding of the analytical framework to tailor the modular questionnaire to the respective interviewee.

A specification was required in the process of operationalising the IoS framework that is not apparent in the framework but became necessary in our particular example of soil conservation policy. This specification relates to the precise definition of policy measures and technical measures, and the identification of the way in which they are linked. This was of particular importance as it defines the link between the institutional and policy analysis and the agri-environmental (soil and farming practices) analysis. This link had to be explained and understood by the researchers involved in the case study investigations so that the appropriate information was gathered and results could be meaningfully combined.

This leads us to one of the challenges associated with the application of the IoS framework to guide comparative case study research. Different conceptions of the researchers responsible for the individual case studies led to different interpretations. The researchers' different conceptions are due to their different disciplinary backgrounds. For example, a soil scientist conceives of soil degradation and suitable "measures" differently than a political scientist. It became obvious that a common understanding of the analytical framework requires intensive discourse, which can not be achieved in a short period of time (as already noted by Gatzweiler and Hagedorn 2003). Each research project therefore will have to strike a balance between time restriction and thorough discussion of the framework and its elements.

In addition, if a comparison across case studies is aimed at, researchers need to cope with empirical heterogeneity. For the case of social, economic and political aspects of the soil conservation issue the framework was more straightforward than for agri-environmental aspects, i.e. the properties of transactions needed to be defined based on a consensus of locally relevant farming practices and conservation measures.

Further challenges associated with the practical application of the framework relate to the following issues. First, policies often do not have their objectives clearly defined and specified which, combined with limited data available on the status of agricultural soils relating to specific threats and impacts of policies, restricts claims regarding policy effectiveness and efficiency. Second, policies do not always include specific technical soil conservation measures, thus it remains difficult to link policies to technical measures and single out which policy might enhance which soil conservation measure. Third, the delineation of actor groups for the empirical survey was not straightforward since some actors belong to two categories at the same time. Last, it became obvious that policies often do not belong to one category only but combine components of instruments, institutions, and governance structures.

The challenges highlighted above mainly relate to the particular case that the IoS framework was applied to. We found no reason to question the general suitability of the IoS framework for structuring institutional analysis. Instead, the framework supported the generation of comparable results from different case studies and linked disciplinary approaches in a coherent way. We consent that the IoS framework is a useful tool for analysing interactions between human activities such as agriculture, and natural systems, in our case with the focus on soils.

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Appendix

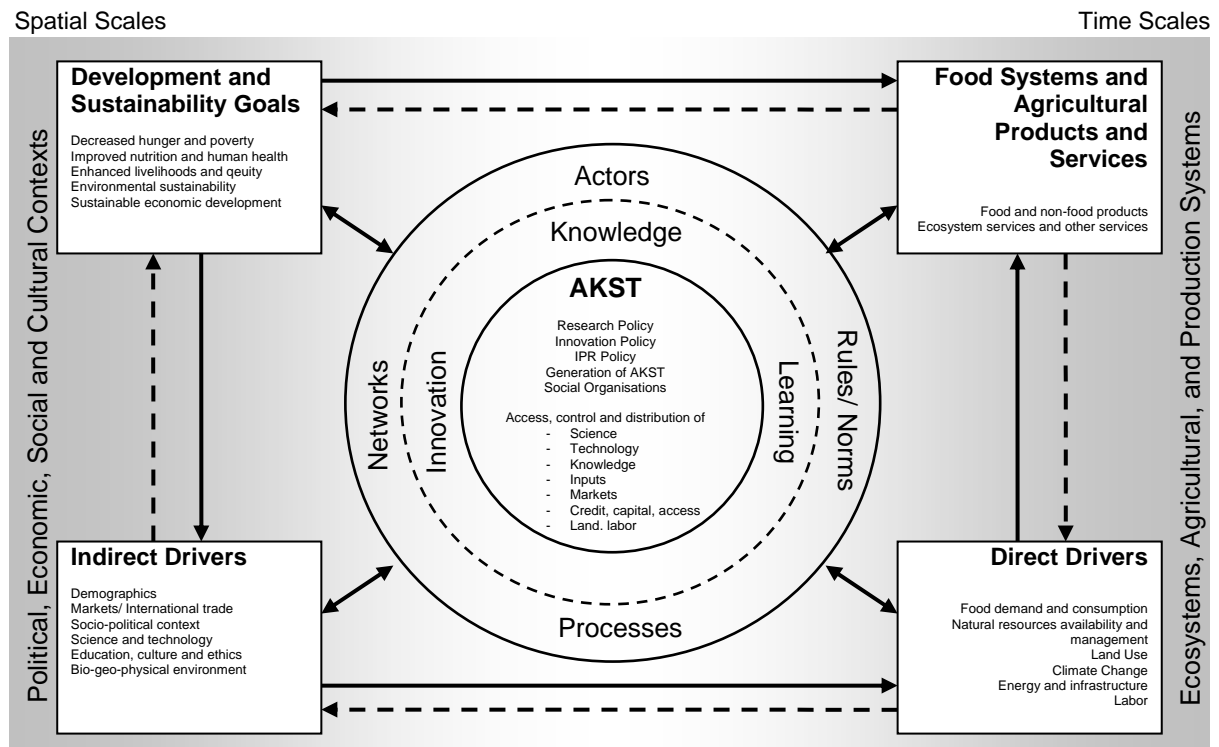


Figure 5: The IAASTD framework (International Assessment of Agricultural Knowledge, Science and Technology for Development) (source: IAASTD 2009:13, slightly modified by Hurni et al. 2008)
(AKST = Agricultural Knowledge, Science and Technology)