SPARD

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Abbreviations

AEM	Agri-enviroment(al) measures
AF	Analytical Framework
CAP	Common Agricultural Policy in the EU
CMEF	Common Monitoring and Evaluation Framework
EAFRD	European Agricultural Fund for Rural Development
EU	European Union
GUI	Graphical User Interface
NUTS	French abbreviation for *nomenclature des unités territoriales statistiques*, a geocode standard for referencing the subdivisions of EU countries for statistical purposes
RD	Rural Development
RDP	Rural Development Plan

Summary

The SPARD project (www.spard.eu) aims at developing tools to analyze to what extent EU rural development measures impact a number of economic, social and environmental objectives that they are designed to target. The foremost important obstacle to the proposed spatial econometric analysis is data availability. This is due to two aspects: The first obstacle applies to all impact assessment problems, the difficulty to construct a counterfactual situation (what would have happened without the policy). The second obstacle is related to the Common Monitoring and Evaluation Framework (CMEF), which SPARD is supposed to base its analyses on.

The CMEF is a relatively new instrument and still under development. Following types of indicators are included: baseline indicators (objective- and context-related), input indicators (expenditures), output (physical), result (physical and successful) and impact. Baseline indicators describe the socio-economic, environmental and farm structure related situation of a region, while the other indicators are related to budget, implementation and impact of rural development measures. There are still many data gaps and the data delivered by the authorities in the member states has not been sufficiently checked yet. In addition, the indicators gathered by the framework refer to different spatial units. Baseline indicators, for example, are available at NUTS2 level (for NUTS3, the data availability is poor), while input, output, result and impact indicators are measured at the programming level. Input, output, and result indicators are available for the single RDP measures, while impact indicators measure the outcome of an entire program (consisting of a number of RDP measures).

This report describes the analytical framework used by SPARD. Based on the available literature and the expertise of the SPARD researchers, the theoretical assumptions followed by SPARD are outlined. Secondly, the expected impacts of EU rural development measures are derived both from previous studies and the available literature. Thirdly, under consideration of the available data from the CMEF, the theoretical assumptions and expected impacts are operationalized for three EU rural development measures, namely modernization of agricultural holdings (121), agri-environment measures (214) and diversification into non-agricultural activities (311). These measures were selected to begin the analysis with. Step-wise the analysis will be extended to all other measures.

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1 Introduction

The EU sustainable development strategy (SDS)[1], launched by EU leaders in Gothenburg in 2001, emphasizes the need for a cost-effective implementation of political measures especially in a situation of decreasing absolute public funds as a result of the EU enlargement (COM 2001, COM 2006b). Cost-effectiveness can be described as the ability to achieve a maximum output for a given financial budget (Drechsler *et al.* 2007a, Klimek *et al.* 2008). This objective is also relevant for funding programs for rural areas based on the Council Regulations 1257/1999 and 1698/2005 implemented through rural development plans (RDPs) in the EU member states.

Rural development is one of the core elements of the European Common Agricultural Policy (CAP), which finances market interventions (taxes, export subsidies, quotas), direct payments and rural development measures.

The rural development pillar embodies a more targeted and programmed approach than market support measures and direct payments, the so-called first pillar of the CAP and is financed through the European Agricultural Fund for Rural Development (EAFRD).

The EAFRD has a clear set of objectives, beneath which sit a suite of more detailed measures, focused on achieving specific outcomes, with detailed criteria for their use. Based on the principle of subsidiarity, Member States are given the flexibility to use the measures, within the context of the overarching objectives, to meet the needs of their national or regional circumstances. Measures are grouped into Axes according to their overarching objectives which focus upon improving the competitiveness of the agricultural and forestry sectors (Axis 1), improving the environment and the countryside (Axis 2), improving the quality of life in rural areas (Axis 3), and the LEADER approach, enabling bottom-up community initiatives (Axis 4). Figure 1 gives an overview of the organization of the EU rural development policy.

[1] http://register.consilium.europa.eu/pdf/en/06/st10/st10917.en06.pdf

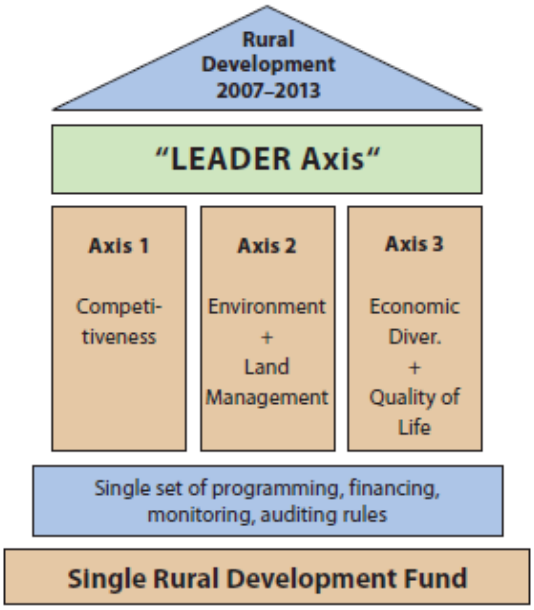


Figure 1: Elements of the EU rural development policy (2007-2013) (Source: COM 2006c)

In order to ensure that all objectives are met, there is a requirement for a minimum proportion of the EAFRD budget (period 2007-2013) to be allocated to each measure (10% for Axes 1 and 3; 25% for Axis 2; and 5% on Axis 4: the LEADER program). Other key characteristics of the rural development pillar are the requirement for European funds to be co-financed by the Member States, and for some measures to require a proportion of private funding.

Detailed reporting and evaluation procedures are also required, and processes are set in place so that this information can then inform revisions to program content, scheme design or implementation processes to improve the added value achieved through this form of public intervention. As building-blocks for each thematic axis a range of pre-defined rural development measures is available Table 1.

Table 1: Overview of the rural development measures in the EU (period 2007-2013)

Axis 1 Competitiveness	**Axis 2 Environment**	**Axis 3 Rural viability**	**Horizontal axis LEADER**
(111) Vocational training and information actions (112) Setting up of young farmers (113) Early retirement (114) Use of advisory services (115) Setting up of management, relief and advisory services (121) Modernisation of agricultural holdings (122) Improvement of the economic value of forests (123) Adding value to agricultural and forestry products (124) Cooperation for development of new products (125) Infrastructure related to the development and adaptation (126) Restoring agricultural production potential (131) Meeting standards based on Community legislation (132) Participation of farmers in food quality schemes (133) Information and promotion activities (141) Semi-subsistence farming (142) Producer groups	(211) Natural handicap payments to farmers in mountain areas (212) Payments to farmers in areas with handicaps, other than mountain areas (213) Natura 2000 payments and payments. linked to Directive 2000/60/EC (214) Agri-environment payments (215) Animal welfare payments (216) Non-productive investments (221) First afforestation of agricultural land (222) First establishment of agroforestry systems (223) First afforestation of non-agricultural land (224) Natura 2000 payments (225) Forest-environment payments (226) Restoring forestry potential and introducing prevention (227) Non-productive investments	(311) Diversification into non-agricultural activities (312) Support for business creation and development (313) Encouragement of tourism activities (321) Basic services for the economy and rural population (322) Village renewal and development (323) Conservation and upgrading of the rural heritage (331) Training and information (341) Skills acquisition, animation.	(411) Implementing local development strategies. Competitiveness (412) Implementing local development strategies. Environment/land (413) Implementing local development strategies. Quality of life (421) Implementing cooperation projects (431) Running the local action group, acquiring skills and ...

All policy measures in the EU, and thus also rural development measures, underlie an ex ante (before program), mid-term, and ex post (after program) evaluation (COM 2000). The experience of previous evaluation periods shows that there are a number of challenges, such as lack of appropriate data (incomplete, delayed), time lag between action taken and impact, time and resource constraints, defining the counterfactual situation (missing control groups) or separating the effects of an intervention from possible other influences (Agra CEAS 2005). In trying to overcome some of these problems, model-based assessments have become of increasing relevance to support evaluation and better targeting of rural development measures.

There are a number of tools that seek to contribute to well-informed decision-making and eventually sustainable policy-making. While in former times, the research arena was dominated by disciplinary approaches, integrative or integrated approaches to policy impact assessment have become increasingly popular in recent years (Van

Ittersum *et al.* 2008, Schaldach & Priess 2008, Piorr *et al.* 2009, Uthes *et al.* 2010b). In tools for assessment of agricultural policies, e.g. the Common Agricultural Policy in the EU, market interventions (taxes, export subsidies, quotas) are usually relatively well covered, while rural development measures are often underrepresented (Uthes *et al.* 2010d).

This is not necessarily a fault in the conceptualization of the available tools. It is more, that due to the individual character of most of the measures merged under the rural development policy of the CAP, they can only be represented in a very coarse way by making assumptions regarding their impacts on overall technological change, while a detailed representation of these policy measures is usually beyond the scope of these tools. Moreover, most tools have an explicit agricultural focus, while some rural development measures, particular in axis 3 and the LEADER axis, address the wider rural context and not only agricultural activities.

1.1 SPARD objectives

The need for cost-effectiveness analysis and the lack of suitable tools gave the motivation for the SPARD project. SPARD stands for "Spatial analysis of rural development measures – Providing a tool for better policy targeting"[2]. The objective of the project is to analyze the relationships between expenditures for rural development measures and their impacts using a spatial econometric modeling approach. This report aims to provide the analytical framework guiding the econometric analysis.

1.2 The Common Monitoring and Evaluation Framework (CMEF)

The analysis in SPARD is intended to be based to a large extent on the Common Monitoring and Evaluation Framework (CMEF), in place since 2007. The CMEF is an indicator framework for monitoring and evaluation of all rural development interventions for the programming period 2007-2013[3]. It is based on the evaluation frameworks used in previous programming periods, but will be implemented in a more systematic manner and adapted to new requirements in the RD regulation (COM 2006a). For example, previous studies and evaluations (e.g., Agra CEAS 2005, Renda

[2] Project website: http://www.spard.eu/

[3] http://ec.europa.eu/agriculture/rurdev/eval/index_en.htm

2006) often criticized the lack of clear objectives for various measures, which prevented effective monitoring and evaluation in former periods.

The new RD regulation requires the explicit definition of objectives. Baseline indicators have been defined and linked to both RD measures and expected impacts to allow for a better assessment of the before-program situation (assessment of needs) and develop the overall program strategy, while the aggregation of outputs, results and impacts at the EU level will help to assess progress in achieving Community priorities (COM 2006a).

These changes increased the necessity for a correspondingly adjusted monitoring and evaluation system, which resulted in the development of the CMEF. The indicators of the new framework are grouped into input, output, result, impact and baseline indicators (COM 2006a).

Input indicators. These refer to the budget or other resources allocated at each level of the assistance. Financial input indicators are used to monitor progress in terms of the (annual) commitment and payment of the funds available for any operation, measure or programme in relation to its eligible costs.

Example: expenditure per measure declared to the Commission

Output indicators. These measure activities directly realised within programmes. These activities are the first step towards realising the operational objectives of the intervention and are measured in physical or monetary units.

Example: number of training sessions organised, number of farms receiving investment support, total volume of investment.

Result indicators. These measure the direct and immediate effects of the intervention. They provide information on changes in, for example, the behaviour, capacity or performance of direct beneficiaries and are measured in physical or monetary terms.

Example: gross number of jobs created, successful training outcomes

Impact indicators. These refer to the benefits of the programme beyond the immediate effects on its direct beneficiaries both at the level of the intervention but also more generally in the programme area. They are linked to the wider objectives of the programme. They are normally expressed in "net" terms, which means subtracting effects that cannot be attributed to the intervention (e.g. double counting, deadweight), and taking into account indirect effects (displacement and multipliers).

Example: increase in employment in rural areas, increased productivity of agricultural sector, increased production of renewable energy.

Baseline indicators.

Baseline indicators are used in the SWOT analysis and the definition of the programme strategy. They fall into two categories:

- *Objective related baseline indicators*. These are directly linked to the wider objectives of the programme. They are used to develop the SWOT analysis in relation to objectives identified in the regulation. They are also used as a baseline (or reference) against which the programmes' impact will be assessed. Baseline indicators reflect the situation at the beginning of the programming period and a trend over time. The estimation of impact should reflect that part of the change over time that can be attributed to the programme once the baseline trend and other intervening factors have been taken into account.
- *Context related baseline indicators*. These provide information on relevant aspects of the general contextual trends that are likely to have an influence on the performance of the programme. The context baseline indicators therefore serve two purposes: (i) contributing to identification of strengths and weaknesses within the region and (ii) helping to interpret impacts achieved within the programme in light of the general economic, social, structural or environmental trends.[2]

Figure 2: The types of indicators used in the CMEF (Source: COM 2006a)

Table 2: Linkages between objective-related baseline indicators and impact indicators

Baseline lead indicators (objective-related)	**Impact indicators**						
	Economic growth	Employment creation	Labor productivity	Reversing biodiversity decline	Maintenance of high nature value farming and forestry areas	Improvement in water quality	Contribution to combating climate change
Economic development	x	x					
Employment rate		x					
Labor productivity in agriculture			x				
Employment development of primary sector		x					
Economic development in primary sector	x						
Labor productivity in food industry			x				
Employment development in food industry		x					
Economic development of food industry	x						
Labor productivity in forestry			x				
Biodiversity: Population of farmland birds				x	x		
Biodiversity: High Nature Value farmland and forestry				x	x		
Biodiversity: Tree species composition				x	x		
Water quality: Gross Nutrient Balances						x	
Water quality: Pollution by nitrates and pesticides						x	
Climate change: Production of renewable energy from agriculture and forestry							x
Climate change: UAA devoted to renewable energy							x
Climate change/air quality: gas emissions from agriculture							x
Employment development of non-agricultural sector		x					
Economic development of non-agricultural sector	x						

The CMEF is still under development and in use only for the first time during the current programming period. Therefore there are still a lot of data gaps with regard to the baseline indicators. In addition, output, result, and impact indicators are not available yet, since they can only be evaluated after the current program has terminated (or even later due to time lags).

First results could theoretically be expected from the mid-term evaluation but, given that these reports are prepared in the national languages and that the synthesis report is usually available at the earliest two years after the national reports, combined with the experience from previous mid-term evaluations, that the mid-term is too short to

assess the impacts of the actions taken, the expectations for the mid-term evaluations from the perspective of SPARD are small.

However, the RDP authorities are required to define targets for output, results and impact indicators and this information is available, although the data quality is poor (authorities used different units, interpretation is difficult, often accompanied with comments in the national language). It will be evaluated in how far the targets can be used as proxies for real outputs, results and impacts. Table 3 provides an overview of the available data including spatial scale and years.

Table 3: Overview of the data availability of the CMEF indicators (status: 09/2010)

Type of indicator	**n (examples)**	**Program Level**	**Spatial scale**
Baseline indicators (Range from 2005 to 2008, most values refer to 2006)	59 lead indicators with each several sub-indicators	-	NUTS2 NUTS3
Input indicators (planned expenditures 2007-2013)	1	Per measure	Country RDP
Output indicators (targets 2007-2013)	1-5 (number of beneficiaries/contracts/actions, supported area, total volume of investment, number of training days)	Per measure	RDP-region
Result indicators (targets 2007-2013)	1-5 (Number of participants that successfully ended a training activity Increase in gross value added in supported holdings/enterprises Number of holdings/enterprises introducing new products and/or techniques Value of agricultural production under recognized quality label/standards Number of farms entering the market Areas under successful land management Increase in non-agricultural gross value added in supported businesses Gross number of jobs created Additional number of tourist visits Population in rural areas benefiting from improved services Increase in internet penetration in rural areas Number of participants that successfully ended a training activity)	Axis 1/3: Per measure Axis 2: Per RDP	RDP-region
Impact indicators (targets 2007-2013)	7 (Economic growth Employment creation Labour productivity Reversing biodiversity decline Maintenance of high nature value farming and forestry areas Improvement in water quality Contribution to combating climate change)	Per RDP	RDP-region

2 Literature review: understanding the RD context and defining relevant terms

2.1 Understanding the programming process of RDPs

Individual rural development measures are bundled in regional development programs. Understanding the programming process is a prerequisite to the spatial econometric analysis in SPARD. This section describes, therefore, the general phases in RD programming including design, planning, implementation and evaluation (see Figure 3), which are described in the following.

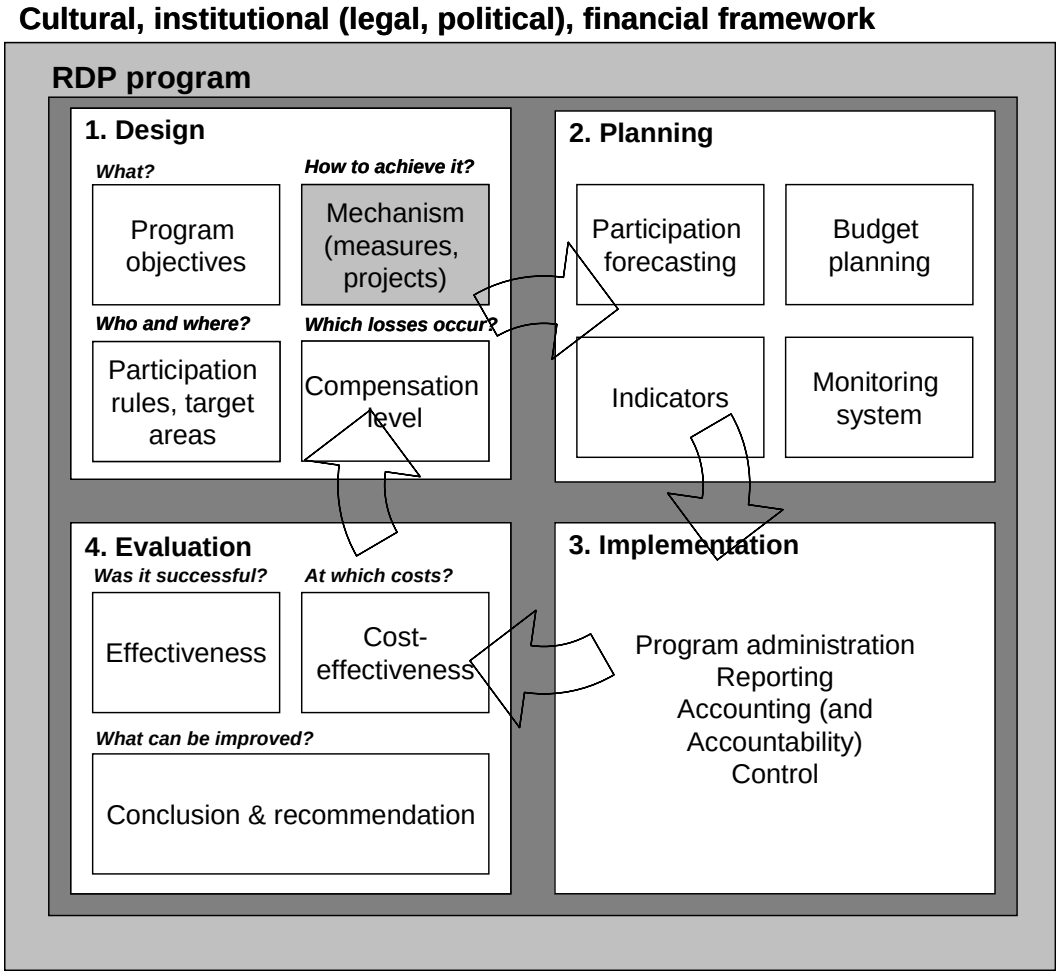


Figure 3: The RD programming process (Source: Sandra Uthes)

In a first conceptual design phase, policy makers and regional experts define the objectives of the program (e.g. the protection of species, support of small farms), in the most precise way possible at this stage. These should be specific, measurable,

agreed, realistic and time-dependent. That good decisions need clear objectives is generally accepted (Bastian et al. 2007). However, rural development measures often aim to improve more than one aspect of and/or function. In practice, designing measures for achievement of often multiple objectives, whatever they are, is a challenging task due to often unclear, uncertain or contradicting relationships between agricultural management and policy outcomes (Claassen *et al.* 2008, Finn *et al.* 2009). Therefore rather diffuse visions and goals tend to dominate and the definition of measurable normative objectives is quite uncommon (Prager & Nagel 2008). In addition, public agencies have their own set of objectives, including such things as budget maximization or avoiding additional work loads (Oates & Portney 2003). Therefore only in theory, the definition of RDP programs including the selection of appropriate measures from the predefined list is driven by the needs identified in the SWOT analysis (ex ante evaluation) (see also the arguments given under 4.2.1).

The design phase is followed by a concrete **planning phase** including the estimation of the likely participation numbers, the budget planning, the definition of additional program indicators (in addition to the indicators already provided by the CMEF) and expected outcomes. Budget planning requires information on expected uptake of measures, and private and public costs of the measures. Uptake is usually predicted through surveys, transfer of uptake figures from studies of similar measures, or behavioral models. The reversibility of participation in rural development measures implies that observed enrolment or expenditure may be a poor guide to future participation. There is therefore always a considerable uncertainty in estimating uptake of rural development measures. The program budget includes direct costs (funding for rural development measures) and administration costs for design, negotiation, monitoring and enforcement of contracts (Moxey et al. 1999). Direct costs depend on the expected uptake and the payment per beneficiary or unit area. Administration costs depend on the complexity of measures, the number of participants, the control rates planned and other factors, which determine the number of personnel and technological equipment needed (database management, IT investment). Transaction costs of rural development measures for both the state and farmers can be very high, particularly in the case of targeted measures. The overall costs are thus significantly under-estimated if they are equated to compensation costs only. Under-estimation in agri-environmental measures, for example, is typically by

around 20-30%, but can also approximate to 100% in some cases (Falconer & Whitby 1999). In practice, participants have an information advantage (information asymmetry) since the regulator cannot observe their true opportunity costs, thus fixed-priced payments are always associated with some over- and under-compensation (Klimek et al. 2008).

When design and planning phase have been successfully passed, the **implementation phase** begins. This phase includes the actual contract management, the control of compliance as well as the financial reporting and accounting.

The final phase in the programming process is the **evaluation phase**. Rural development measures in the European Union, for example, underlie currently an ex ante (before program), mid-term, and ex post (after program) evaluation (COM 2000). Program evaluation is either performed only once or can become a regular activity, depending on the time horizon of a program. The goal is to identify whether the program was effective and efficient in achieving the objectives defined in the design phase and whether unintended side-effects occurred or whether the program was too expensive and to identify possible weaknesses in the program design and errors in the planning phase. It is obvious that the programs should not be reviewed by the responsible authorities themselves, but by independent experts, to avoid potential biases.

Theoretically, measuring effects of rural development requires assessing the differences between two states: the state *with* the policy and the state *without* it, the so-called counterfactual (Hodge & McNally 1998). Practically, the state without policy is difficult to identify, e.g. due to missing control groups and measurement problems (Primdahl et al. 2003). Actual policy evaluation is therefore dominated by before-after comparisons (COM 2000) and, since particularly ecological effects are difficult to prove, mainly judged on so-called output indicators, such as enrolled area or number of participating farmers. Programs will only have an impact if they reach a scale that is large enough to be felt at the level of the objectives. A first step in the evaluation is therefore to compare planned and actual uptake. Participants usually choose measures that are most consistent with their specific conditions and require relatively low adjustment of current practice. As a result, measures with a high effectiveness have usually a low acceptance and vice versa.

The limitation of output-indicator-based approaches is that they are rather indirect measures of effectiveness. The next step is, therefore, to further specify the quality of the output. Within the CMEF, the result indicators will deliver information on this aspect (once they are available). As a last step, the overall program performance regarding the seven impact indicators (see Table 3, page 8) has to be assessed.

A recent report by the European Evaluation Network for Rural Development has reviewed available methods for assessing the impacts of rural development programs (including AEM) in the context of multiple intervening factors (Lukesch & Schuh 2010). The report structures the major evaluation problems and illustrates good practice examples from different countries with the objective to facilitate the knowledge transfer within the EU evaluation network and to provide guidance for common problems. However, a general breakthrough in this field is not provided due to the already described challenges and several other constraints.

2.2 Defining Efficiency and Effectiveness

The two terms 'effectiveness' and 'efficiency' have been used interchangeably in policy analysis, but for this investigation the distinction between the two is necessary as each will require specific methodologies in order to measure and discover the main determinants of policy performance (Mandl *et al.* 2008).

Firstly, in considering the most appropriate definition for the two terms, the dictionary definition provides a good foundation. For instance the word 'effective' in the Oxford dictionary (Oxford University Press 2010) is defined as *"producing the result that is wanted or intended; producing a successful result"* therefore effectiveness could be interpreted as a measuring whether the results have had the desired effect. The word 'efficient' on the other hand is defined *"as doing something well and thoroughly with no waste of time, money, or energy"* (Oxford University Press 2010). The dictionary definitions of these words show that whilst both are concerned generally with success of a particular action, effectiveness is determined with resulting impact, whereas efficiency is more closely related to how cost-effective[4], in terms of resource use, those actions have been.

[4] Cost-effectiveness is described as the ability to achieve a maximum output for a given financial budget (Drechsler *et al.* 2007a, Klimek *et al.* 2008).

These dictionary definitions give a general perspective on how these two terms are related and how they also differ, but further explanation is required to highlight exactly how to differentiate between the two, and what this means in terms of RDP policy analysis for SPARD. Mandl's *et al*. (2008) report on the 'effectiveness and efficiency of public spending' also addresses these issues, and argued that any analysis into effectiveness and efficiency should be concerned with the *"relationship between inputs, outputs and outcomes"*. This is a core function of the CMEF providing *input, output, baseline, results* and *impact* indicators and guidance on understanding their interrelated relationships. The data obtained on these corresponding indicators are fundamental to the RDP analysis on policy efficiency and effectiveness.

2.3 How to Measure Efficiency and Effectiveness

Mandl *et al*. (2008) illustrated the conceptual framework for effectiveness and efficiency as seen in Figure 4, showing the distinction between *inputs, outputs* and *outcomes* and their relationship with efficiency and effectiveness. Mandl *et al*. (2008) observe the 'input-output ratio', albeit a basic method is how efficiency can be measured. Simply put, the greater the 'output' for a given 'input' the greater the efficiency of that measure will be, and this can be compared across RDP regions. Take for example the RDP measure 'Modernisation of agricultural holdings' (121), to measure efficiency this would relate the *'input'*, the CMEF indicator on allocated expenditure[5], with the *'output'* which will be measured on the immediate affects of that measure, for instance by the 'number of farm holdings that received investment support' and the 'total volume of investment'.

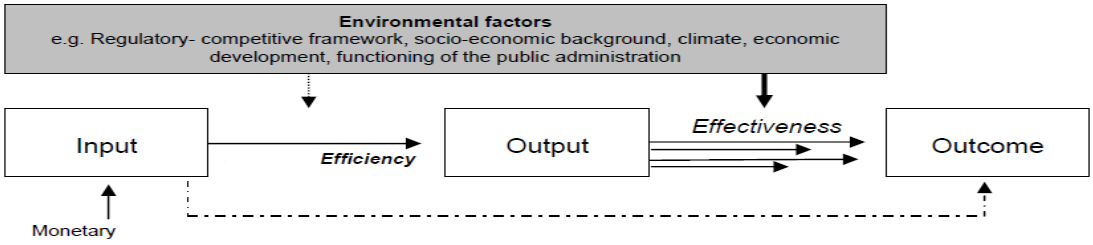


Figure 4: Conceptual Framework of efficiency and effectiveness adaptation (Source: Mandl et al.*, 2008)*

[5] but also include non-monetary (physical) resources (Mandl *et al*. 2008)

Effectiveness, within this conceptual framework, Figure 4, is also related to input and output but crucially, in addition, linking objectives with the resulting 'outcome'. For instance using the measure 121 as a continuing example, the 'specific objectives' are to 'improve productivity of physical capital by improving farms through technology, innovation and diversification', with 'overall objectives' to 'improve competitiveness of agriculture'. Effectiveness can be assessed in whether the 'outcome' of that measure has met its objectives, using the available 'outcome' information, which will primarily be done, in the case of SPARD by assessing the trends of the CMEF 'baseline' indicators.[6]

The difficulty in isolating effects to assess efficiency and effectiveness is also evident in Mandl's *et al.* (2008) framework. This is illustrated with the 'environmental factors' in Figure 4, which refer to the multiple influences possibly outside the control of policy makers that will also have an impact on the measures 'output' and 'outcome' (Mandl *et al.* 2008). These influences whether they are recognised as being within the control of policy-makers or not, maybe dependent (among other things) on the level of aggregation of that analysis (Mandl *et al.* 2008).

Finally in our understanding of efficiency and effectiveness, it should be pointed out that while their principles are similar, it is still possible to achieve one without the other. Efficiency for instance, might be considered high in terms of the input and output ratio, but the measure in question may still fail to meet its objectives, consequently being ineffective. Whereas a measure can be effective in achieving the desired result but still be inefficient in its implementation e.g. the input of resources (include expenditure and also time) may have been high in comparison to the output.

2.4 Efficiency Frontier

In order to further understand how efficiency can be interpreted and measured, the 'efficiency Frontier' provides a useful example. Mandl *et al*. (2008) put forward the concept of the efficiency frontier' (productivity possibility frontier) as presented in Figure 5.

[6] It should be noted that the final outcome of any particular measure may not be realised within the time frame of that policy period (if ever in some cases), and so forth we should consider 'outcome' ultimately as progress so far in meeting those objectives.

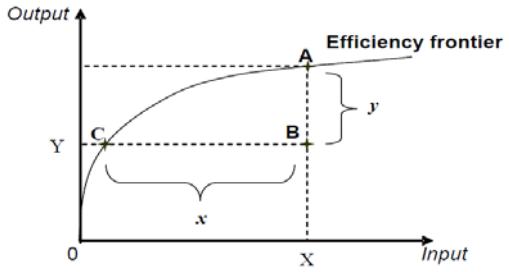


Figure 5: Efficiency frontier (Source: Mandl et al. 2008)

Mandl *et al. (2008)* explain that if two countries (A and B) have the same inputs (i.e. the same amount of expenditure for the same purpose); then if country A has a higher output than B it will be considered as more efficient. Therefore country A is considered to be the 'efficiency frontier' (Figure 5). On the other hand country C has a lower input compared to both A and B, and also a lower output, but is still considered efficient and is also within the 'efficiency frontier'; accordingly as both A and C have achieved the maximum output with their allocated input (Mandl *et al.* 2008). Therefore country B, to become more efficient, has two possible options, it may choose to lower its inputs by *x*, to reach the efficiency of country C (know as input-efficiency) or attempt to increase its outputs to reach the same level of Country A by *y* (know as output-efficiency).

Although a simplification of the whole process, the efficiency frontier helpfully illustrates that by understanding when actions are inefficient, the information can be used as a tool to review both the inputs and outputs between regions and how policy could be adapted.

2.5 Understanding Efficiency and Effectiveness in Policy Making

Measuring the economic efficiency and effectiveness of policies is an important aspect for policy-makers in evaluating policy performance. This is necessary to ensure that public funds are being targeted to meet policy needs without excess, in other words to show public accountability that funds are being spent in the most 'cost-effective' manner. Furthermore, Farrell (1957) explained that for policy-makers; *"it is*

important to know how far a given industry can be expected to increase its output by simply increasing its efficiency, without absorbing further resources". This statement stands true for RDP analysis, in that agriculture or rural businesses can be considered the 'industry', and the increased 'output' will be in terms of meeting the core objectives. Additionally this statement, as indicated in the economic frontier concept, highlights the decision policy-makers have to make in whether to justify additionally spending on a measure to improve the output, or/and whether attempts to improve the efficiency of a measures implementation and maintenance is required.

In any policy assessment of efficiency and effectiveness observing the other influencing factors, referred to earlier as 'environmental factors', will unequivocally need to be taken into account. Additionally considering how various measures may influence each other, whether from EU policy and/or national cross-over effects will be a central consideration to SPARD's investigations. In the interest of evaluating the efficiency and effectiveness of EU-27 RDP, understanding their relationship and how they can be measured, determining their performance will effectually provide the basis for policy recommendations. Essentially the European Commission and Member States should continually be evolving policy in order to make them more 'efficient' in order and more 'effective' in meeting both European, national and local objectives and needs.

3 Introduction to Spatial Econometrics

3.1 Basic principles

Spatial econometrics is all about allowing for interaction between the spatial units of observation, or in other words, to include cross-effects across space. In policy analysis, the concept is closely linked to the effectiveness of a policy measure. Some policies may seem less efficient at a local level than they actually are when looking at a wider area; and some policies have beneficial effects on one area by itself, but neutral or detrimental effects on a region as a whole. Arguably, these problems are worse when the units of action and observation become smaller. One of the functions of spatial econometrics is therefore to determine what the actual spatial scope is both of policy measures and of other effects.

Figure 6 shows how spatial spillovers fit in a general picture of spills and spillovers. Out of six possible destinations of the money spent, we distinguish:

- money that reaches the exact target;
- money that is spent completely fruitlessly;
- and money that misses either the exact measure or the exact region, which covers the other four destinations.

Such a misspending of money can be due to a misallocation, or to an indirect effect, where money was well spent, but part of its effect indirectly affects other targets. In fact, such a mechanism can be unwanted but also desirable:

- Such an effect is unwanted, if the indirect effect is on regions or target groups who do not benefit from the money. In those cases, other measures might be more fruitful.
- However, if the indirect effect is on regions or target groups who justly benefit from it, the actual impact of the measure is greater than we would have thought without considering the spillovers, and the measure can be said to be more effective.

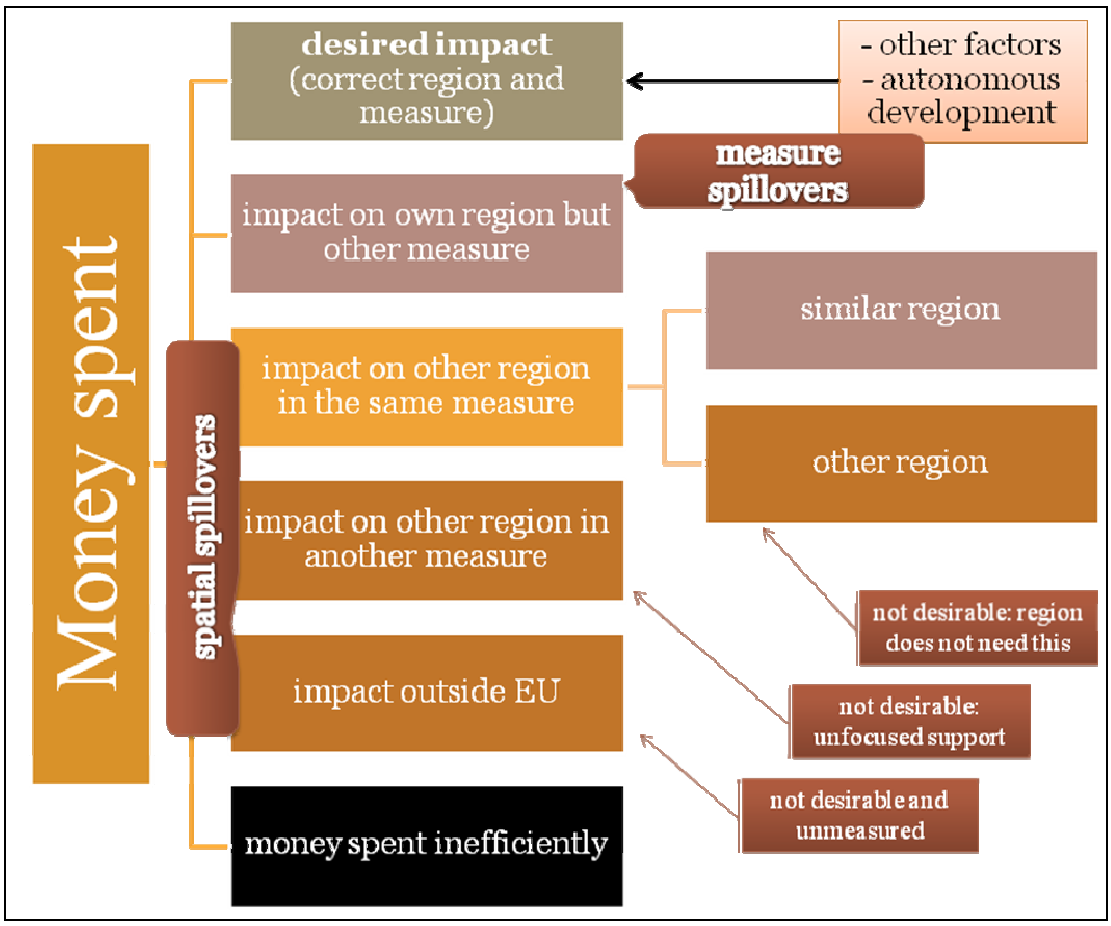


Figure 6: Possible types of spillovers

3.2 Importance of spatial econometrics

Why are spatial interaction effects important? Basically, this is because regions are related and linked to each other. Thus policy in one place can have an (additional) effect on nearby regions. In SPARD, we are (among other things) interested in the spatial reach of policy measures. We can distinguish several effects, which we will briefly discuss here, and then illustrate in mathematical notation in the next section.

First of all we can distinguish direct (or 'endogenous') effects: something in location A directly influences something in location B (see Figure 7, left). A basic example is that crime in street A tends to influence crime in street B. Another example: a high level of biodiversity in area A can have a direct effect on the level of biodiversity in area B, because species can move from one to the other. This implies that improving biodiversity in one place can have an additional positive effect in nearby regions.

Secondly, we can distinguish indirect effects (Figure 7, middle): strict law enforcement in street A may push crime into street B. Another example is ecological

dumping, when strict laws on how to deal with waste in one country can result in a dumping effect in less strict countries. A final example is the effect of flooding measures in one place that increase flooding risks in downstream areas.

Thirdly, there are correlated effects: something in location A is the result of cause C that also causes something in location B. It often happens that we think something affects both locations but we do not know exactly what cause C is. An example is a high level of school dropouts, resulting in a high level of crime in both streets A and B; we can also think of an (unknown) factory that emits toxic substances in the air, causing certain species to disappear in both areas.

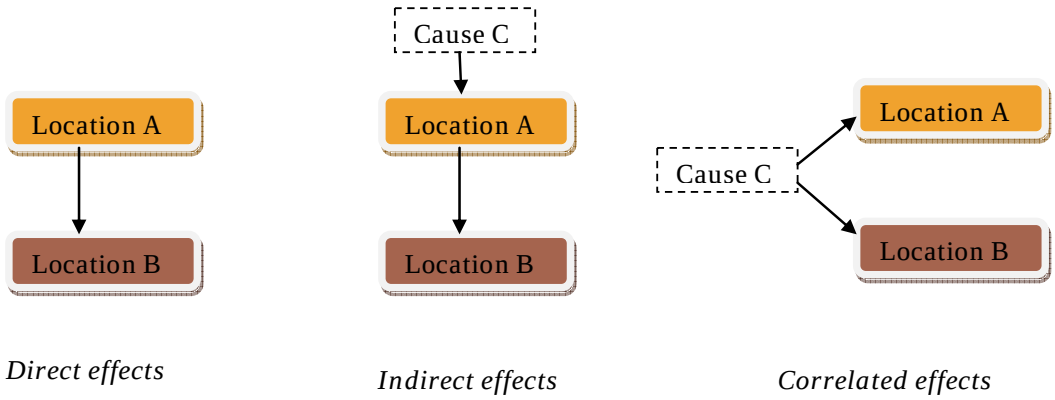


Figure 7: Spatial effects

3.3 Operationalizing spatial econometrics

There are different ways to conduct spatial econometrics. Simple spatial heterogeneity can be captured reasonably well with regional dummies, possibly interacted with an independent variable if the effect of that variable varies by region. Another type of spatial variable that is often encountered is a distance to some important place (e.g., to the nearest airport; this corresponds somewhat with Figure 7, left). Among the more advanced models, however, two main approaches are in use, covering situations:

- where the outcome in one region is affected by the outcome in neighboring regions (a spatial lag model; Figure 7, middle)
- where the outcome in one region is affected by unknown characteristics of the neighboring regions (a spatial error model; Figure 7, right).

An example of the first type would be a house price. Obviously, the price of a house depends on its age and size, the number of rooms, the presence of a garage, etc. However, the prices of nearby houses may also have an impact.[7] In vector notation, we estimate

$$P = \alpha + \beta X + \rho WP + \varepsilon$$

instead of

$$P = \alpha + \beta X + \varepsilon$$

with X being a vector of house characteristics and P the price of a house. ρ is the coefficient estimated for the spatial lag. Note that this effect also allows for a boomerang effect: any change in prices in region A will have an effect on prices in region B, which in turn will affect the prices in region A. The most distinguishing aspect of the formula is the matrix w; this is the spatial weights matrix. Although this is a crucial element in a spatial econometric estimation, its function is fairly simple: it 'depreciates' the effects of the other observations by some distance-related characteristic. The most common characteristics used for a spatial weight matrix are Euclidean distance (possibly squared), travel time, and border contiguity.

For the second case, the so-called spatial error model, we can think of productivity in a factory. If we have information on just inputs of labor and capital as well as the sector of a firm, and estimate

$$Prod = \alpha + \beta \mathbf{Labour} + \gamma \mathbf{Capital} + \delta \mathbf{Sector}_{\mathbf{dummies}} + \varepsilon$$

then a map of the error terms ϵ might show a spatial pattern – most likely, clusters of high and low values together. Those unobserved effects are probably agglomeration effects, and if we cannot control for them, they will distort the estimates for β, γ and δ. We can prevent this by splitting the error term into a spatial component and a leftover error u:

$$\epsilon = \lambda W\epsilon + u$$

with λ as the coefficient estimated for the spatial error, and W again as the spatial weight matrix. u is the unobserved non-spatial error for every observation.

[7] The example is not perfect, as all housing prices in the neighbourhood are also influenced by an unobserved "neighbourhood quality" variable.

3.4 Examples

3.4.1 Agricultural employment and EU support

In an as yet unpublished paper, Dall'erba and Van Leeuwen (2006) discuss the influence of EU support both through the CAP and Objective 5 on agricultural (un)employment. One of the problematic issues they investigated is that the CAP was, at least in its earlier years, officially aimed at production and increasing productivity. Without an even bigger increase in total production, an increase in productivity will lead to a decrease in employment. Under objective 5, and specifically under objective 5b, rural areas 'at risk' were targeted, and regions with high unemployment or low income benefited from this objective. The question Dall'erba and Van Leeuwen pose is basically whether the total effect of these two subsidies was positive or negative over the years 1989-2003. In doing so, they take into account the influence of EU funds spent in neighboring regions, with the effect of neighbors weighted by the travel time between regions. They reject both using a contiguity matrix, which would give problems with regions that are islands, and the use of distance, which would not take mountainous areas properly into account.

Their spatial effects are incorporated as a *spatial error model* (see above), and they find that the unobserved characteristics in one region play an important role in neighboring regions. As for the subsidies, there their hypothesis was not confirmed: changes in agricultural employment between 1989 and 2003 were not significantly influenced by the amount of EU subsidies spent.

3.4.2 Aquaculture in India

Paraguas & Dey (2006) investigated whether spatial spillovers between aquaculture farms in Indian states result in productivity convergence. Their approach offers something beyond the usual OLS-with-spatial-effects. Instead, they focus on the distribution of productivity between states, and ask themselves whether this distribution changes over time, for example by becoming narrower. They find that this is the case, and therefore conclude that a state whose neighbor experiences a growth in aquaculture productivity is itself in a better position to experience growth too.

The most interesting conclusion in the article by Paraguas and Dey is that if spatial lags or errors are *not* taken into account, the estimated speed of convergence is faster.

In this case, spatial autocorrelation that is unaccounted for might lead to a lack of policy, since predictions might be too bright.

3.4.3 Structural funds

In yet another paper from 2006, Everdeen et al. (2006) discuss EU cohesion policy with a special focus on efficiency. Their main finding is that although the allocation of structural funds does not seem to influence regional growth rates in a standard modeling approach, accounting for regional characteristic changes this picture: then, a positive effect of structural funds can be measured in regions that have a good institutional quality, while structural funds have a significantly negative effect on regions with a bad institutional quality or a higher degree of corruption. The local effect of cohesion policy is thus conditional upon local circumstances, and the effectiveness of the policy shows spatial heterogeneity.

An extra problem that Ederveen, De Groot & Nahuis discuss is that of co-financing from within the region. In a way, this system absorbs local resources that might have been spent on other policy measures. Thus, if a European program makes inefficient choices, not only money from the European level is ‘lost’, but also some local funds.

3.5 Intermediate conclusion

Spatial econometrics can add a worthwhile dimension to the planning and evaluation of spatial policy, as it can show how local effects spill out to nearby regions. As for its operationalization, a spatial lag model might be the most likely option for policy analysis, where the input (‘cause’) is known, and the effect on both the target region and on other regions can be measured.

For further reference, some key publications in the field of spatial econometrics are the works of Luc Anselin (Anselin & Florax (edd.) 1995, and more recently (Anselin & Florax 1995, Anselin 2006a, Anselin 2006b)). Interesting applications in the field of rural and regional policy are (Bivand & Brunstad 2002), (Dall'erba & Le Gallo 2008) and (Dall'erba & Le Gallo 2007).

4 The SPARD Analytical Framework

4.1 Intervention logic of rural development measures

(taken from modulation study (Nowicki et al. 2009), adjusted)

To assess the impacts of rural development measures arising from greater expenditure across a range of measures, it is necessary to develop the intervention logic, measure by measure. This demonstrates the intended causality from putting a measure in place, via stimulating changes at farm and individual business level, to achieving final outcomes on, for example farm structures, employment, quality of life and the environment. The intervention logic can be understood both in terms of economic mechanisms – the relationship between RD measures and explicit economic drivers – and in terms of non-market benefits.

The intervention logic as a whole is complex as measures have different types of relations with economic drivers and each driver has a specific impact. In addition, one of the key aims of many of these measures is to intervene in the provision of environmental and social benefits that are not provided by the market, and these also need to be reflected. Although measures can be grouped in relation to their broad overarching objectives, to understand the detailed objectives and intended outcomes of individual measures, the intervention logic for each measure needs to be examined separately. Therefore, we distinguish four steps in determining the intervention logic for each RD measure.

Firstly, we set out the global, intermediate, specific and operational objectives for each measure, derived from Council Regulation 1698/2005 and supporting policy documents (for example the Community Strategic Guidelines and individual measure fiches linked to the Common Monitoring and Evaluation Framework). In the second step, we examine the causality between individual RD measures and economic drivers, such as factor productivity, income payments, and human capital. We sub-divide these drivers with regard to the main production factors of land, labor, capital, as well as an overall factor index. These two steps are expressed in Table 6. In the third step we examine the impact of the economic drivers on key indicators used in the study as proxies for assessing the impacts of modulation on the study themes, as found in Table 7. Fourthly, going beyond the economic drivers, we consider the

relationship between each RD measure and the provision of environmental and social non-market benefits.

Table 8 sets out the non-market environmental and social benefits that each measure within the EAFRD has the potential to deliver. For some measures, these non-market benefits are the primary rationale for the existence of the measure and therefore of the intervention logic underlying it. For example, the intervention logic for all Axis 2 measures, with the exception of the animal welfare measure, is to improve the environment and the countryside and to support the sustainable use of agricultural land, thereby leading to the maintenance or enhancement of biodiversity, landscape, water quality, soil quality and helping contribute to climate change adaptation and mitigation.

For other measures, while the environmental or social non-market benefits are not the primary rationale for the introduction of the measure, improving the sustainability of agriculture or enhancing natural capital are still included within their objectives, and intervention under such measures can still achieve significant environmental and social benefits. Examples of such measures in relation to the environment are the farm modernization measure and the advisory measures under Axis 1, which are focused on improving the competitiveness of the farming and forestry sectors, but in doing so can improve the quality of the environment, for example by providing support for investments to modernize livestock housing, improve silage storage, improve equipment for the spreading of animal wastes and renewable energy infrastructure, with potential benefits for water quality and reductions in greenhouse gas emissions.

There is another subset of measures where the potential non-market benefits are more of an indirect nature, where possible environmental and/or social benefits are derived indirectly from the implementation of the measure. For example, measures focused on the development of new products or food quality schemes under Axis 1 or those targeted at diversification, setting up new businesses or promoting tourism under Axis 3. In these cases non-market benefits are only likely to arise where these are required to underpin the activity itself, or are a by-product of the activity undertaken.

The four steps together, brought together in Table 6, Table 7 and Table 8, provide the causality between RD measures and expected outcomes. For the purposes of this study, we have identified indicators in the field of competitiveness, farm structure, farm income and employment in Table 7, and the environment and quality of life as

found in Table 8. The chain of analysis can be demonstrated by looking at two specific examples, relating to the vocational training measures under Axis 1 (Table 4) and the agri-environment measure within Axis 2 (Table 5).

Taking the vocational training measure (111) first, Table 4 sets out the objectives for this measure.

Table 4: Objectives for measure 111 for vocational training and information actions

Objective level	**Level of impact**	111 Vocational training and information actions
Operational Objectives	Beneficiary	To ensure an appropriate level of technical and economic training is available, beyond those already available as part of normal agricultural and forestry education programs, for all those involved in agricultural, food and forestry activities. To include training to develop expertise in new information technologies; and awareness in the fields of: product quality, results of research on sustainable management of natural resources
Specific Objectives	MS/Region	To improve the level of technical and economic expertise of those involved in agricultural, food and forestry activities
Intermediate Objectives		To enhance and adapt human potential
General/ Global Objectives	EU	To improve the competitiveness of the agriculture and forestry sectors To enhance the environment and the countryside

Source: 1) Rural Development policy 2007-2013 Common monitoring and evaluation framework (CMEF) – Guidance note E – Measure Fiches; 2) Council Regulation (EC) No 1698/2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD), 20 September 2005; 3) Council Decision 2006/144/EC on Community Strategic Guidelines for rural development programming period 2007-2013; 4) SEC (2005) 914 Annex to the Proposal for a Council Decision on Community Strategic Guidelines for Rural Development: Update to Impact Assessment Report SEC (2004) 931, Commission Staff Working Document

From Table 4, we can see that this measure aims to develop new skills for all people involved in agriculture and forestry. Table 6 then, links these objectives to economic drivers, demonstrating that higher levels of education are likely to directly increase labor productivity (++ = main correspondence between a measure and an economic driver), but also that it is likely to improve their skills to use the land and capital in a more efficient way. The training also leads to a higher stock of human capital in the economy. Table 7 illustrates the third step, linking the economic drivers to specific indicators. This suggests that an increase in labor productivity is likely to lead to an increase, for example, in GVA and output, but has a negative impact on employment in the short term. The latter is caused by the assumption that in agriculture the direct labor saving effect due to technological change is larger than the increased expansion effect due to more production, due to a lower price as costs have been reduced (inelastic demand); the long term effect is, however, to strengthen the resiliency of the remaining on-farm employment. The overall effect of measure 111 on employment is

therefore not clear and depends on, *inter alia*, the elasticity of demand. Lower food prices lead to more demand for other goods and services and thus create more employment in other sectors. Historically in Western countries, whenever agricultural labor productivity has risen this has led to a reduction in agricultural employment, but not to an increase in overall unemployment. Demand for food may be price-inelastic, but not overall demand and this is what counts for the impact on overall welfare. The overall impact on employment can thus likely be neglected. The impact on output and farm income should be positive as all economic drivers work in the same direction. Although not captured within this table, it is clear from the objectives of this measure that it is also likely to provide benefits for the environment through, specifically, the improved management of natural resources, which is shown in Table 8.

Taking the agri-environment measure (measure 214), as another example, the focus of this measure is the provision of payments to farmers for introducing or continuing agricultural production methods compatible with the protection or improvement of the environment or the landscape. The objectives for this measure are set out in Table 5.

Table 5: Objectives of agri-environment measures (214)

Objective level	**Level of impact**	214 Agri-environment payments
Operational Objectives	Beneficiary	To encourage farmers and other land managers to introduce or maintain production methods compatible with the protection of the environment, the landscape and its features, natural resources, the soil and genetic diversity that go beyond mandatory standards To require beneficiaries to adhere to cross-compliance requirements
Specific Objectives	MS/Region	To support the sustainable development of rural areas To respond to society's increasing demand for environmental services
Intermediate Objectives		To support the sustainable use of agricultural land
General/Global Objectives	EU	To improve the environment and the countryside

Source: 1) Rural Development policy 2007-2013 Common monitoring and evaluation framework (CMEF) – Guidance note E – Measure Fiches; 2) Council Regulation (EC) No 1698/2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD), 20 September 2005; 3) Council Decision 2006/144/EC on Community Strategic Guidelines for rural development programming period 2007-2013; 4) SEC (2005) 914 Annex to the Proposal for a Council Decision on Community Strategic Guidelines for Rural Development: Update to Impact Assessment Report SEC (2004) 931, Commission Staff Working Document

These objectives may lead to lower yields due to extensification of farming practices, including fertilizer reduction and reductions in stocking densities, for example. Table 6 links these likely outcomes to the key economic drivers. This indicates that the implementation of the agri-environment measures may decrease labor productivity as more labor may be required to undertake the actions required, for example, more traditional forms of management such as hedgerow management or maintenance of

other landscape features (stone walls, terraces etc) in good condition. Agri-environment payments are calculated mainly on the basis of compensation for income forgone due to the activities prescribed under the scheme. However, there is likely to be an element of deadweight associated with expenditure under the agri-environment measure, as some farmers would probably have continued with those same management practices without the payments. In this case, these payments can be seen as contributing to the income of the farm. In the second step (Table 7), the lower productivity aspect has a neutral to negative impact on production, whereas the income payment aspect has a positive impact. Although not captured within economic related tables, as is clear from the objectives of the measure, and demonstrated in Table 8 the agri-environment measure is intended to have a significant positive impact on the environment, in relation to biodiversity, landscape, water quality, soil quality, and increasingly climate change.

These types of links between the objectives of the measures and the anticipated outcomes have been determined for all rural development measures. They are used to inform the development of hypotheses and assumptions driving the analysis in SPARD.

Table 6: Rural Development measures and corresponding economic drivers

	Economic drivers											
	Productivity				Factor payment				Supporting			
	Total factor	Labour	Capital	Land in agri-culture	General	Labour	Capital	Land	Product quality	Human capital	Fixed assets	Land available for agri-culture
Axis 1												
111 Vocational training and information actions	+	++	+	+		+			+	+		
112 Setting up of young farmers	++	+	+	+		+				+		
113 Early retirement of farmers and farm workers	+	++	+	+						-		
114 Use of advisory services by farmers and forest holders	++	+	+	+		+			+	+		
115 Setting up of farm management, farm relief and farm advisory services, as well as of forestry advisory services	++	+	+	+	+					+		
121 Farm modernization	+		+				+				++	
122 Improvement of the economic value of forests	+	+	++	+					+			
123 Adding value to agriculture and forestry products	++	+	+		+				+			
124 Cooperation for development of new products, processes and technologies in the agriculture and food sector and in the forestry sector	++				+					+		
125 Improving and developing infrastructure related to the development and adaptation of agriculture and forestry	++		+									
126 Restoring agricultural production potential damaged by natural disasters and introducing appropriate prevention actions	++		+	+							+	+
131 Helping farmers to adapt to demanding standards based on Community legislation					++							
132 Supporting farmers who participate in food quality schemes					+				++			
133 Supporting producer groups for information and promotion activities for products under food quality schemes					+				++			
141 Supporting semi-subsistence agricultural holdings undergoing restructuring	+	+			+	++		+				
142 Supporting setting up of producer groups	+	+			++	+			+	+		
Axis 2												
211 Natural handicap payments to farmers in mountain areas				0 / -/+				++				+
212 Payments to farmers in areas with handicaps, other than mountain areas				0 / -/+				++				+
213 Natura 2000 payments and payments linked to WFD								++				+
214 Agri-environment payments		0/-		0/-		+		++				+

215 Animal welfare payments			-				++					
216 Support for non productive investments				0/-			++					
221 First afforestation of agricultural land				0/+				+				-
222 First establishment of agro-forestry systems on agricultural land				0/+				+				-
223 First afforestation of non-agricultural land								+				
224 Natura 2000 payment				-/0				++				
225 Forest environment payments				-/0				++				
226 Restoring forestry potential and introducing prevention actions	++			+								
227 Support for non-productive investments							++					
Axis 3												
311 Diversification into non-agricultural activities							+			++	+	
312 Support for business creation and development							+			++	+	
313 Encouragement of tourism activities							+			++	+	
321 Basic services for the economy and rural population							+			++	+	
322 Village renewal and development	++									+		
323 Conservation and upgrading of the rural heritage					++					+		
331 A training and information measure for economic actors operating in the fields covered by Axis 3	+	++								+		
341 A skills acquisition and animation measure with a view to preparing and implementing a local development strategy	+	++								+		
Axis 4												
41 Implementing local development strategies	++									+		
421 Implementing cooperation projects	++									+		
431 Running the local action group, acquiring skills and animating the territory	++									+		

Legend: *'++' = principal correspondence between a Rural Development measure and an economic driver; '+', '0' and '-' are additional relative weightings.*

Table 7: Economic drivers in relation to thematic indicators

	Indicators						
	Competitiveness		**Farm structure**		**Farm income**	**Employment**	
	GVA	Gross Output	No. of Farms	Avg. size* of farms	Farm income	Agri. labor force	Total employment
Total factor productivity	+	+	-	+	+	?	?
Labour productivity	+	+	-	+	+	-	?
Capital productivity	+	+	-	+	+	?	?
Land productivity in agriculture	+	+	-	+	+	?	?
Income payment, general	± /2	+ /1	+ /1	- /1	+	+ /1	?
Income payment, labour	± /2	+ /1	+ /1	- /1	+	+ /1	?
Income payment, capital	± /2	+ /1	+ /1	- /1	+	- /3	?
Income payment, land	± /2	+ /1	+ /1	- /1	+	- /3	?
Product quality	+	+	?	+	+	+	+
Human capital	+	+	?	+	+	-	?
Fixed assets	+	+	?	+	+	?	?
Land available for agriculture	+	+	+	+	+	?	?

General comments/remarks:
For this list of economic drivers the assumption is that they are increasing - apart from the last one (shift in preferences) which is not directional.
Based on the assumption of inelastic demand for agricultural products.
/1: depends on the objective of each measure and how it has been implemented
/2: if increased output has a negative price effect GVA might remain constant or even decline
/3:: if substitution effect is larger than expansion effect, which is often the case in agriculture as demand is inelastic 'size' in ESU*
Indicators criteria: 1) reflect goals, 2) quantifiable, 3) correspond to our models, 4) independent of one another

Table 8: Rural Development measures and their relationship to non-market indicators

	Bio-diversity	Water Quality	Soil Quality	Landscape	Climate Change	Quality Of Life and Rural Vitality
Axis 1						
111 Vocational training and information actions	+	+	+	+	+	+
112 Setting up of young farmers						+
113 Early retirement of farmers and farm workers						
114 Use of advisory services by farmers and forest holders	+	+	+	+	+	+
115 Setting up of farm management, farm relief and farm advisory services, as well as of forestry advisory services	+	+	+	+	+	+
121 Farm modernisation		+	+		+	+
122 Improvement of the economic value of forests	+	+	+	+	+	Indirect
123 Adding value to agriculture and forestry products	+	Potential indirect effect		+		+
124 Cooperation for development of new products, processes and technologies in the agriculture and food sector and in the forestry sector	Potential Indirect effect					Indirect
125 Improving and developing infrastructure related to the development and adaptation of agriculture and forestry	Very variable					+
126 Restoring agricultural production potential damaged by natural disasters and introducing appropriate prevention actions	Very variable					+
131 Helping farmers to adapt to demanding standards based on Community legislation		+	+		+	Indirect
132 Supporting farmers who participate in food quality schemes	Potential indirect effect					+
133 Supporting producer groups for information and promotion activities for products under food quality schemes	Potential indirect effect					+
141 Supporting semi-subsistence agricultural holdings undergoing restructuring	Potential indirect effect					+
142 Supporting setting up of producer groups	Potential indirect effect					+
Axis 2						
211 Natural handicap payments to farmers in mountain areas	+	+	+	+	+	+
212 Payments to farmers in areas with handicaps, other than mountain areas	+	+	+	+	+	+
213 Natura 2000 payments and payments linked to WFD	+	+	+	+	+	Indirect
214 Agri-environment payments	+	+	+	+	+	+
215 Animal welfare payments						
216 Support for non productive investments	+	+	+	+	+	+
221 First afforestation of agricultural land	+	+	+	+	+	Indirect
222 First establishment of agro-forestry systems on agricultural land	+	+	+	+	+	Indirect
223 First afforestation of non-agricultural land	+	+	+	+	+	Indirect
224 Natura 2000 payment	+	+	+	+	+	Indirect
225 Forest environment payments	+	+	+	+	+	+
226 Restoring forestry potential and introducing prevention actions	+	+	+	+	+	Indirect
227 Support for non-productive investments	+	+	+	+	+	+
Axis 3						

311 Diversification into non-agricultural activities	Potential indirect effect		+	+
312 Support for business creation and development	Potential indirect effect		+	+
313 Encouragement of tourism activities	Potential indirect effect			+
321 Basic services for the economy and rural population	Potential indirect effect			+
322 Village renewal and development	Potential indirect effect			+
323 Conservation and upgrading of the rural heritage	Potential indirect effect	+	Potential indirect effect	+
331 A training and information measure for economic actors operating in the fields covered by Axis 3	Potential indirect effect			+
341 A skills acquisition and animation measure with a view to preparing and implementing a local development strategy	Potential indirect effect			+
Axis 4				
41 Implementing local development strategies	Potential impact but very variable			+
421 Implementing cooperation projects				+
431 Running the local action group, acquiring skills and animating the territory				+

*Key: + - where measure has the **potential** to result in a non-market benefit. Whether these outcomes are achieved in practice will depend on the priorities attached to each measure within individual Rural Development Programs, and the design and implementation of schemes in practice.*
Sources: Rural Development policy 2007-2013 Common monitoring and evaluation framework (CMEF) – Guidance note E – Measure Fiches - accessible at: http://ec.europa.eu/agriculture/rurdev/eval/guidance/note_e_en.pdf
Council Regulation (EC) No 1698/2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD), 20 September 2005
Council Decision 2006/144/EC on Community Strategic Guidelines for rural development programming period 2007-2013
SEC (2005) 914 Annex to the Proposal for a Council Decision on Community Strategic Guidelines for Rural Development: Update to Impact Assessment Report SEC (2004) 931, Commission Staff Working Document

4.2 Defining the scope and scale of the analysis in SPARD

4.2.1 What is x and what is y?

The principal methodological task in SPARD is to estimate the statistical relation between a dependent variable and one or more explanatory variables in a spatial context.

The selection of dependent and explanatory variables for the spatial econometric analyses in SPARD will be based on causal relationships according to economic theory. The degree of influence of the explanatory variables on the selected dependent variables will be depicted from the regression coefficients.

A possible assumption would be that the performance of the baseline indicators, reflecting the needs of different regions, can explain (to some extent) the budget allocation for different measures or at least axes.

Assumption I: Needs determine expenditures

The available literature, however, discusses uniquely that this is not the case for different reasons: path-dependency (authorities stay with established measures instead of making experiments), risk of loosing budget in future periods in case of low uptake in current period, financial risk if EU regulations are violated (Prager & Freese 2009).

Dwyer et al. (2008a) list the following reasons for differences between needs, choice of measures and resource allocation:

a) The RDP is only a part of a much bigger picture of available resources for meeting key RD needs within a Program area.

b) Program expenditure is significantly affected by spending commitments from the previous period which may not coincide with the current needs assessed.

c) Programming authorities have decided that continuity and familiarity with measures is more important than targeting all current needs, exactly.

d) There is a lack of capacity in particular areas / among certain groups.

e) There are gaps in the RDP menu.

f) In some areas, a strong agricultural/agri-food industry influence over funding decisions, plus a policy attitude that CAP is basically about agriculture, have led to particularly low allocations to Axis 3 measures despite key needs in this area.

g) Tension exists between targeting and achieving a holistic delivery.

h) There are insufficient resources to address needs properly and therefore some key needs go short of funds.

i) Other minor issues of various kinds

The assumption that needs determine expenditures should therefore be rejected.

Assumption II: Expenditure (input) determines impact

Another possible assumption would be to follow a bottom-up perspective, arguing that the regional authorities know their local conditions best, are aware of the regional needs and also have a good idea of the possible uptake and other framework conditions which cannot directly be expressed by a few indicators (transaction costs, information on the legal system, existence of other instruments). The chosen mix of measures and the corresponding measures could be assumed to be quasi-optimal as result of taking into account all possible trade-offs and finding the best compromise in the given context. This would also mean that general objectives applied to all measures are doomed to fail, as each measure has its own specific objectives and is therefore also the best option to achieve this objective (otherwise the measure would not have been chosen). If so, differences in effectiveness between measures do not exist, all measures are equally effective regarding their specific objectives. Since effects could then be ignored the only differing information is the cost of each measure per unit output, consequently leading to the assumption that the higher the cost, the higher the impact.

This assumption may often be true. For example, measures with a higher environmental impact usually involve more complex management prescriptions and thus higher on-farm compliance costs, which are used for the calculation of the payment standard. E.g. in Brandenburg, Germany, permanent set-aside of agricultural land for 10 years including land care for the whole period yields a payment of 450 Euro/ha annually. The much less environmentally beneficial measure “extensive grassland management” including livestock density restrictions, no use of fertilizers and pesticides (in this already relatively extensive area) costs only 130 Euro/ha. For a comparison of different measures, the general tendency is that measures with a higher impact usually have higher private costs and therefore require higher payment rates. Within a single measure, however, the relation between private cost and (environmental) impact is often less close (Claassen et al. 2008), for example, as a result of different an uneven distribution of site potentials among farms (Uthes *et al.* 2010c). The assumption that expenditure determines impact is therefore also no suitable approach.

Instead, the relationship between expenditures and impact is the principal focus of analysis in SPARD.

To be explored I: Relation between expenditure (input) and impact

This analysis is precluded from the beginning due to lack of real data in the output, results and impact category (only targets are available).

As an intermediate solution, we will therefore focus on the change in baseline indicators in relation to the expenditures for RD measures.

To be explored II: Relation between expenditure (input) and change in baseline indicators

However, the relationship between expenditure and impact[8] relationship is complex: if a less than optimal impact is achieved for a given amount of expenditure, we would want to know why this happened – was the activity improperly implemented or was it implemented correctly but yet did not lead to the intended result? This is why the intervention logic for the RDP was set up, as specified in the CMEF system of indicators. In other words, the relation between expenditure (or input) and impact must be broken down into different steps.

Figure 8 presents a scheme of these steps, in the context of the overall planning cycle. The green boxes represent the indicators to be used in SPARD, the red arrows are the relationships between these indicators - to be modeled in SPARD. The different elements in the figure are relevant to different actors in the planning and implementation process. For instance, efficiency tells us something about the quality of implementation, whereas effectiveness addresses the question whether the policy is an adequate way to achieve the stated objective (see 2.2). The various elements in Figure 8 are explained below.

[8] For simplicity, we continue to speak of „impact“ which is not to be confused with the CMEF „impact indicators“ for which we have no data. „Impact“ refers to the change in CMEF baseline indicators over a defined period of time.

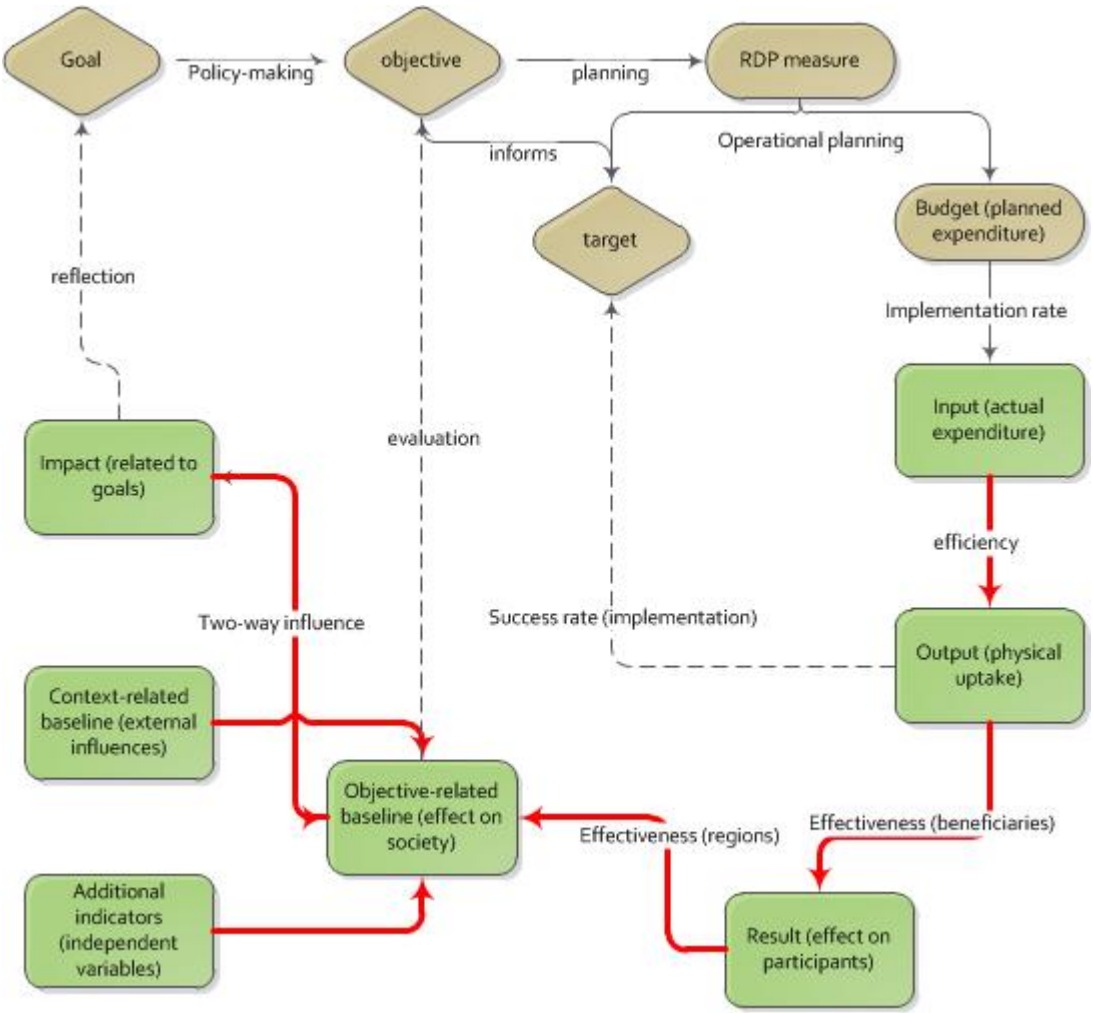


Figure 8: The intervention logic of rural development measures (Source: Stijn Reinhard/Tom Kuhlman)

A goal is seen as an expression of the aspirations of a society towards a better or more sustainable life. It is formulated in general terms and may not necessarily be achieved by any particular policy. An objective is more specific: formulated by policy-makers as something they think can actually be achieved and which will contribute to the goal. RDP measures are designed to help achieve the stated objectives. Any specific RDP as formulated by the appropriate authority (national or regional as the case may be) will contain quantitative targets and budgets.

All these are essential elements of any program, but outside the scope of SPARD. Even the rate of success in getting the earmarked funds spent (which depends on the extent to which the intended beneficiaries avail themselves of the opportunities offered by the program) is not part of our analysis. Instead, our starting-point is the relationship between actual expenditure (input) and the output achieved. This relationship is measured as efficiency (see chapter 2.2).

The output can further be compared to the target, which is another criterion on which the implementation of the measure can be judged.

The next step in the analysis is the relationship between output and result. The result can be defined as the effect that the intervention has had on the beneficiary; in those cases where the recipient of the funds is not the intended beneficiary (e.g. where farmers get compensated for nature conservancy), the result may be considered as the local effect of the intervention. In the CMEF scheme, such effect is taken to belong not to an individual measure, but to an entire axis.

From results we move to what is usually called impact, but what in the CMEF system is measured by objective-related baseline indicators. These show whether the local benefits measured by result indicators also have an impact on the wider society, as measured at NUTS2 level. These two sets of indicators may be considered together to constitute the measures of effectiveness. The effectiveness at regional level may be confronted with the objectives, in order to evaluate to what extent they have been achieved. SPARD should provide the tools for such evaluation.

The CMEF also contains impact indicators, but these are more remote from the effect of the RDP itself. Although the RDP may be expected to have some influence on them, that influence is likely to be small and hard to measure. On the other hand, some of these impact indicators are themselves likely to affect the success (efficiency and effectiveness) of the RDP – which is why Figure 8 contains a two-way arrow between impact and objective-related baseline indicators. This is particularly the case for impact indicator 3 (labour productivity), and to a lesser extent for indicator 1 (economic growth): in both cases, the effect of these indicators on the success of RDP measures is likely to be larger than the other way round. One of the first three indicators is superfluous, by the way, because any two of them determine the third one.

The other impact indicators (4-7) are of an environmental nature; 4, 5 and 6 (on biodiversity , HNV farmland and water quality) are useful for evaluating Axis-2 measures. Indicator 7, on production of renewable energy, does not appear to be related to any measure and therefore cannot serve as an indicator of RDP effectiveness. It is proposed that impact indicators 1 and 3 are used as independent variables, indicators 4, 5 and 6 as dependent ones, and indicators 2 and 7 are left out of the analysis.

Finally, the context-related baseline variables. These are independent variables in the analysis, our x-es so to speak. However, the set may not be complete, and we have been encouraged to

invent other variables that may be relevant in explaining the change in the dependent variables. So a box has been added to Figure 8 to represent those additional ones.

4.2.2 Time scale and data availability

The question is: for which years should we collect and use data? The CMEF database is being built since the beginning of RDP-II, i.e. since 2007. Realistically, the latest figures we may be able to use in SPARD will be for 2010. In that year, we cannot expect to find much impact of a program which only started in 2007 and which in many cases will have seen only limited implementation in the first two years – let alone results. This is why it was proposed to use input and output data from RDP-I. Hence, we would measure the effectiveness of that program from indicators collected in RDP-II. This brings three problems of its own:

The CMEF database does not exist for RDP-I; we have to rely on evaluation reports per member state or, where the RDP is decentralized, per region (e.g. NUTS1 in Germany, NUTS2 in Italy and France).

RDP-I was active only in the fifteen member states of the EU as of the year 2000. This leads to a smaller number of regions to be included in the analysis.

The measures are different in RDP-I.

The latter problem can be solved by a correspondence table, in which the measure codes of the two programs are compared. Regarding the other two problems, we hope to find sufficient data to do an analysis with at least all individual RDPs in the EU-15.

Meanwhile, for the case studies we may attempt to get the data for RDP-I at beneficiary level. From there, they may be aggregated to any desired spatial level, for instance municipalities. That level will have to be chosen in such a way that there is an adequate number of spatial units per case study – at least 4.

4.2.3 Spatial units

If the units of analysis in a statistical-econometric model are regions, the model is called a spatial econometric model (‘Spatial Econometrics’). The use of spatial units in a regression model is often accompanied by spatial autocorrelation. Spatial autocorrelation expresses the degree of dependency among observations in a geographic space, for example as a result of spillover effects or the Area-Unit-Root Problem. The general aim is to use the real “functional” areas in the analysis. The problem is that many indicators are provided for administrative units, such as the NUTS regions, which are not necessarily identical with the functional areas.

Spillover effects arise, for example, from the fact that 'tacit knowledge' (= knowledge that is transmitted primarily through personal contacts) spreads across regions through regional networks. Another can be that pollution spreads from one region to an adjacent one, or that adjacent regions often have similar biophysical characteristics Available studies showed that telecommunication relations are far less intense compared to personal contacts. In this respect, the scope of regional networks is usually limited to some neighboring regions (the farther away, the lower the effect), so that a spatial dependence arises particularly for adjacent areas. The presence of spatial autocorrelation leads to distorted regression coefficients or invalidity of significance tests.

The ***Area-Unit-Root problem*** is relevant when administrative units are used instead of the real functional areas. Effects of, for example, commuting on regional labor markets are then not considered.

One of the tasks is to define the spatial units to be used in SPARD, influenced by following factors:

- the functionality of each RD measure (according to results from the literature and available theories and knowledge, see section 4.1)
- the data availability (CMEF, other data sources), see below

Objective- and context-related baseline indicators are reported for NUTS2 and NUTS3 regions. The most recent publication is following report: RD_Report_2009_Chapter3_Regional_Tables-B.xls (2009)[9].

Data source: The data come mostly from EUROSTAT (different databases), the Farm Structure Survey (FSS), the European Environmental Agency (EEA) or directly from the Member States.

Years: Data refer to single years ranging from 2005 (net migration) to 2008 (employment related indicators). Most indicators are from the year 2006. It seems that the report always seeks to publish the most recent figures. The variation in years is due to that indicators may have different update cycles and that Member States may be delayed in reporting figures.

Changes in indicators: The report also provides figures for the change in baseline indicators (not all indicators are covered), but these changes refer to different periods, for example the

[9]http://ec.europa.eu/agriculture/agrista/rurdev2009/RD_Report_2009_Chapter3_Regional_Tables-B.xls

"change in population density" is calculated for the period 1995-2006, while the "change in educational attainment" is calculated for the period 2005-2008.

Coverage: Values are provides for the NUTS2 (n=271) and NUTS3 (n=1303) levels. In total, there are 59 so-called baseline lead indicators. The above mentioned report covers 34 of the total 59 lead indicators.

The lead indicators may be underpinned with several sub or even subsub- indicators, therefore the total number of indicators behind the 34 is higher (n=79). The following graphs show the data available for these 79 indicators:

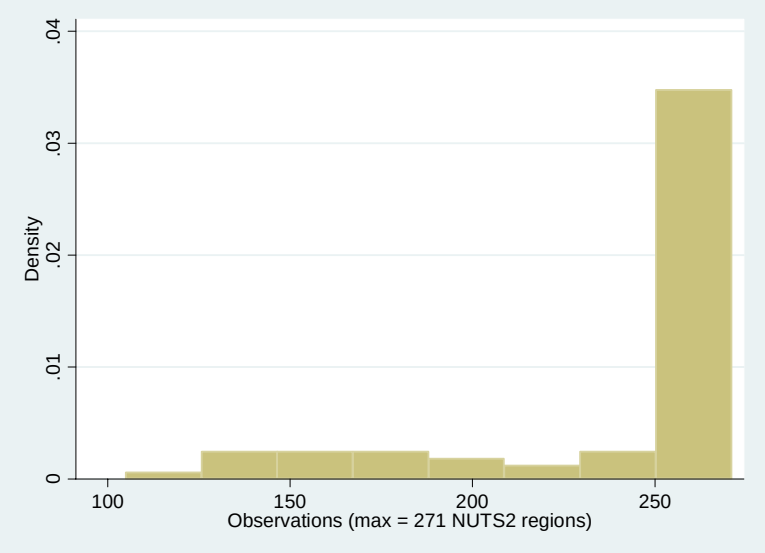


Figure 9: Data availability of CMEF baseline indicators at the NUTS2 level, reported by the European Commission in 2009

- 36 out of 79 indicators are available for all 271 NUTS2 regions.

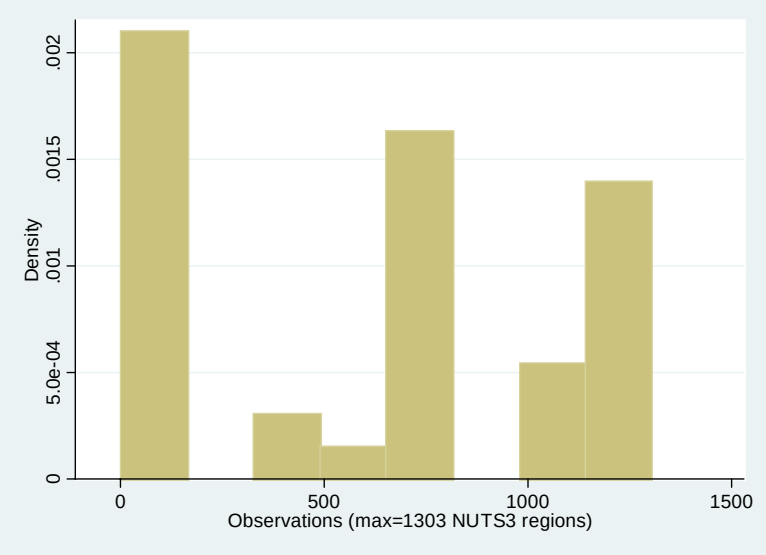


Figure 10: Data availability of CMEF baseline indicators at the NUTS3 level, reported by the European Commission in 2009

- 9 out of 79 indicators are available for all 1303 NUTS3 regions.
- 27 out of 79 indicators are not available at all.

Baseline indicators are incomplete (only 34 out of 59 available) and refer to different years. The data coverage (referring only to the 34 indicators) is good at the NUTS2 level and poor at the NUTS3 level. Changes in indicators are reported (with gaps) but they are often not comparable as they refer to different periods.

Intermediate conclusion for the analysis: NUTS2 is the preferred scale for the analysis. The use of the calculated changes in baseline indicators requires further analysis. **Expenditure will have to provided at NUTS2 level (currently only at country-level available)**

4.3 Proposed workflow for SPARD

Having outlined the challenges arising from the different scales that the analysis will be touching as well as the lack of data in large parts of the CMEF in the previous chapters, Figure 11 illustrates the developed intermediate workflow for SPARD.

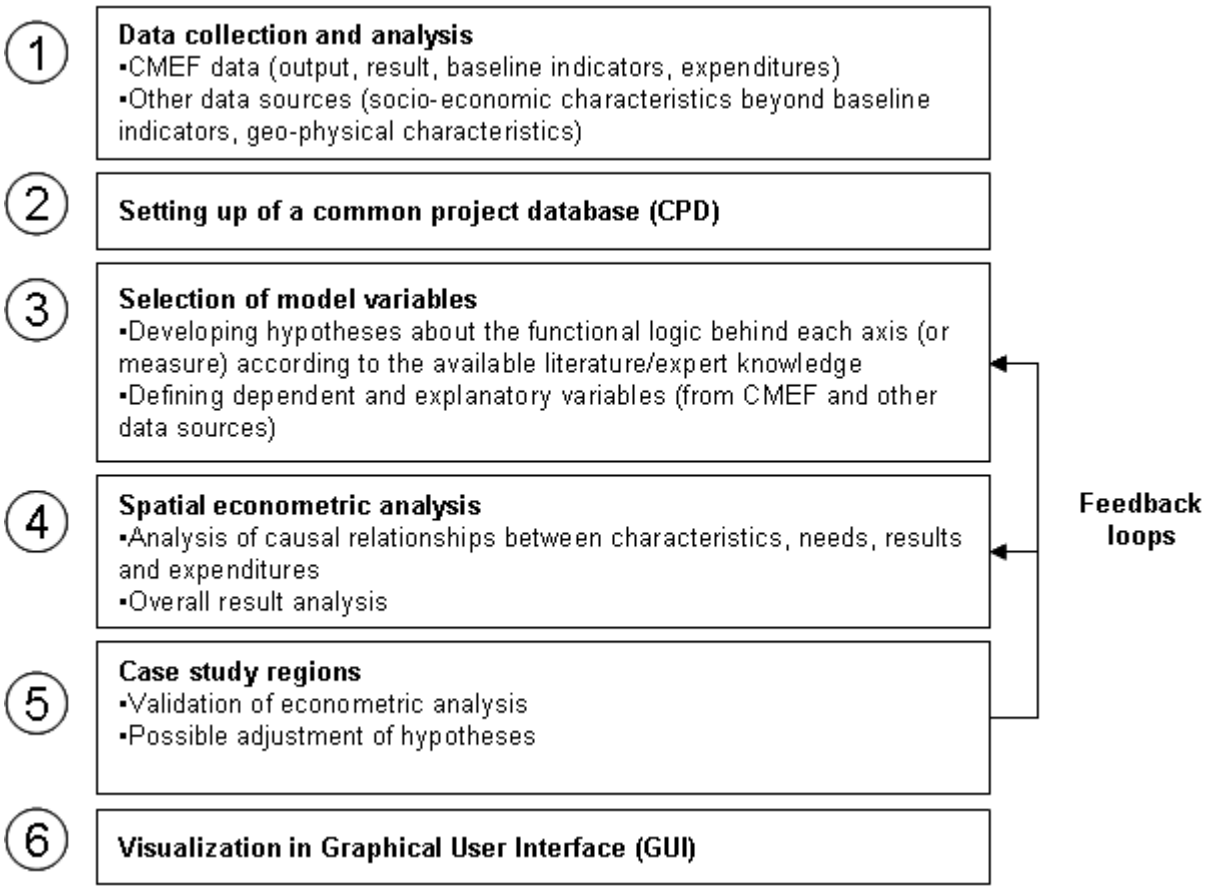


Figure 11: Workflow proposed for SPARD

As a first step, available data primarily from the CMEF but also from other data sources such as the farm structure survey will be gathered.

The collected data will be transformed in a database-compatible format, stored in the SPARD project database, analyzed (errors, data gaps, exploratory data analysis) and data gaps will be closed, if possible, through additional data from other sources or proxy indicators.

As preliminary steps to the spatial econometric analysis, detailed profiles for each RD measure will be developed based on previous reports and projects. The profiles will combine information on the intervention logic, results from available evaluations and other scientific publications to derive initial hypotheses on the functionality of the measures and anticipated

impacts. It will also be assessed in how far the collected data allow the testing of the hypotheses developed.

Having developed a suitable, harmonized dataset for the spatial econometric analysis, the next step is to adjust the hypotheses formulated initially according to data availability. This step includes the selection of dependent and explanatory variables for each measure according to available theories and knowledge. The data availability also determines the spatial scale of the analysis, for example if data are only provided at NUTS2 level, an analysis at NUTS3 level will be impossible. If program-related data is only available for programming regions, without the possibility of disaggregating them to a NUTS level, the analysis will have to be performed at the programming level.

In a next step, the developed hypotheses will be tested econometrically. The results from the analysis will be reflected against the information from the measure profiles. Modifications of the hypotheses will also be tested, as necessary.

In order to avoid getting lost in the figures without a concrete regional background, more detailed information from the SPARD case study regions will be used to test the plausibility of the econometric results and to again refine hypotheses, as necessary, leading to a circular flow between the formulation of hypotheses, the spatial econometric analysis, and the validation in case studies.

The final step is the visualization of the results in maps and charts in the Graphical User Interface (GUI) to be developed by SPARD.

5 Profiles of the three key RD measures

The analysis in SPARD can be performed at different levels: at the programming level, at the level of the axes, for groups of measures or at the level of single measures.

Given the challenges arising from the different levels of analysis as well as the unsatisfactory data availability, the SPARD team decided on the second project meeting (5-6th August 2010 in Müncheberg, Germany; confirmed on the forth project meeting in Bologna, April 28-29 2011) to further develop the initial analytical framework by focusing on three single RDP measures, one from each of the three thematic axes and then to continue stepwise with the analysis.

Selection criteria were a high importance in terms of total RD funding, a high degree of coverage in the EU and that the measure was already several years in place (to be able to use results from previous programming periods).

RD measures to begin the analysis with:

- 121 farm modernization
- 214 agri-environment payments
- 311 diversification into non-agricultural activities

To continue in a **second step**, three other measures can be selected:

- 112 setting up of young farmers
- 211+212 natural handicap payments to farmers (mountains and others)
- 322 Village renewal and development

The **third step** will be the analysis of "families" of measures, followed finally by the rest.

Remark: The second and third step cannot be carried out during the project life time for reasons of data availability.

5.1 Modernisation of agricultural holdings (121)

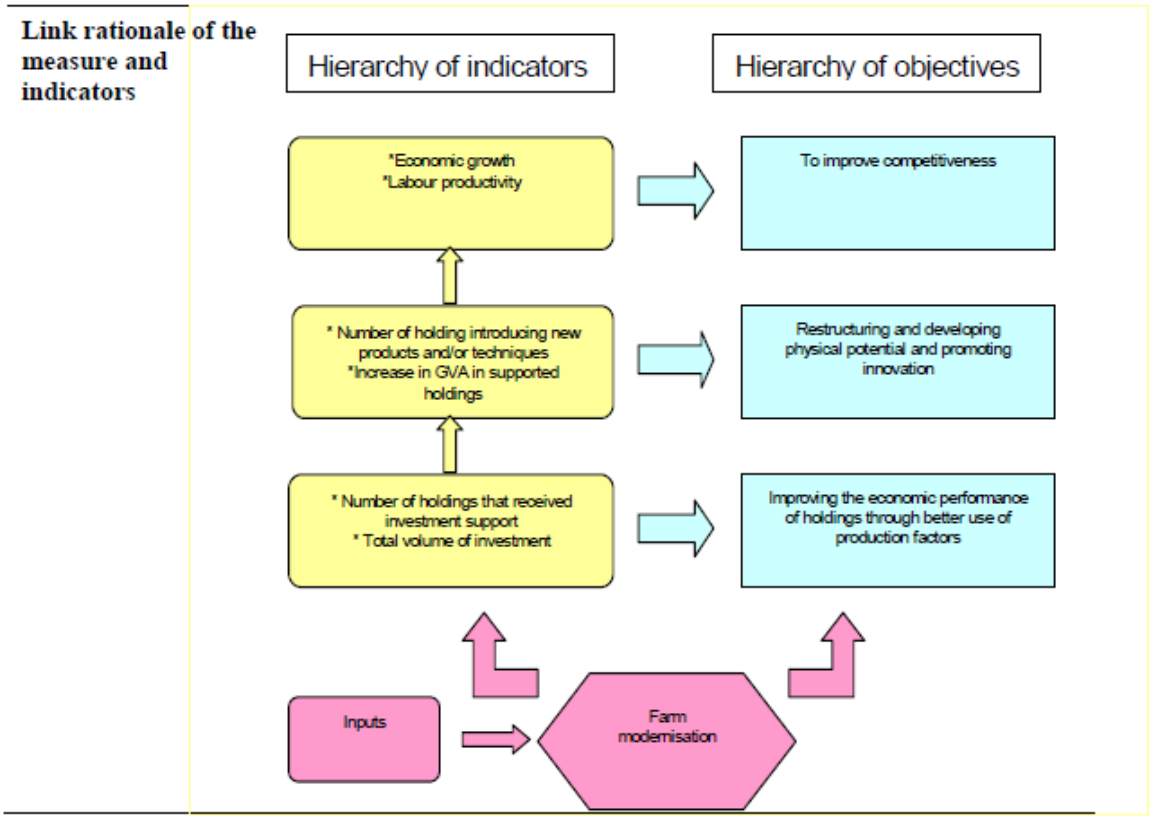
5.1.1 History

Support for investments in agricultural holdings has been available in one form or another since the mid-1960s, along with support for investment in the processing and marketing of agricultural products (Agra CEAS 2005) and has since been a permanent instrument of the CAP, as can be seen in

Table 9.

Table 9: History of the measure „farm modernisation“ (121)

Council regulation	**Name of the measure**	**URL**
60ies Guidance section	Support for physical capital (investments) in the farm and downstream sector	http://ec.europa.eu/agriculture/rur/publi/propimpact/text_en.pdf
Council Directive 72/159/EEC (1972)	Modernization of farms	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31972L0159:EN:HTML
EC No 1257/1999	Title 3 Chapter 1 Article 4 “Investment in agricultural holdings”	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1999:160:0080:0102:EN:PDF
EC No 1698/2005	Article 26 “Modernisation of agricultural holdings”	http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:277:0001:0040:EN:PDF



Evaluation questions	To what extent have supported investments contributed to a better use of production factors on agricultural holdings? In particular, to what extent have supported investments facilitated the introduction of new technologies and innovation? To what extent have supported investments enhanced market access and market share of agricultural holdings? To what extent have supported investments contributed to an enduring and sustainable activity of agricultural holdings? To what extent have supported investments contributed to improving the competitiveness of the agricultural sector?

Figure 12: Intervention logic of the measure 121[10]

[10] http://ec.europa.eu/agriculture/rurdev/eval/guidance/note_e_en.pdf

Table 10: Examples of investments supported under the measure „farm modernisation“ (121)

Thematic area	**Examples**
Introduction of new technologies and innovation	Automated animal identification system, Milk meter, Farm business management/recording software, Global Positioning System (GPS), Electronic tag reader
Improved animal welfare and health	Automated/robotic slurry scraping system, Cow cubicle mats, Rotary livestock scratching brush, Mobile sheep shower,
Increased hygiene control and product storage	Vermin proof bulk feed bin, Potato store ambient cooling ventilation system
Enhanced Occupational Safety and Business Efficiency	Calving gate incorporating dead lock gate, Weighing platform or load bars for cattle crush
Increased energy efficiency	Electric/water heat pads for farrowing and weaner accommodation, Solar panel water heating system, Rainwater harvesting pre-fabricated covered tank with filter and pump
Enhanced environmental status	Weather station for crop pest/disease monitoring, Steam boiler for soil/ compost sterilization, Quad/ATV fertiliser sower

Source: Northern Ireland farm modernization program (DARD 2009)

Need/problem	**Inappropriate farm structures**
Measure	• Financial support for investment
Expected results	• Modernisation of the beneficiary holding • Better use of production factors • Redeployment of production/diversification into alternative activities
Expected impacts at the level of the beneficiary/ holding	• Maintenance or improvement of farm incomes through reduction in costs, fair standard of living for farmers and their families • Maintained/increased employment through increased activity on the farm Improved product quality • Improved viability of the beneficiary holding
Expected impacts on the agricultural sector in general	• Contribution to agricultural restructuring • Increased competitiveness • Promoting the diversification of farm activities • Improved market balance (as a result of redeployment of production, uptake of alternative activities etc.)
Expected impacts on the rural society	• Maintenance/improvement of the structural and productive characteristics of the rural economy • Natural environment protected/improved • Improved animal welfare standards • Improved hygiene conditions/human health • Improved rural incomes • Maintenance/creation of employment • Maintenance and reinforcement of viable social fabric in rural areas

(Agra CEAS 2005)

5.1.2 Fiche provided in the review of RD instruments

Source: (Dwyer *et al.* 2008b)

	Part A: Description	
A.1	Title of instrument:	**Modernisation of agricultural holdings**
A.2	Existing instrument or new instrument:	Existing instrument (121)
A.3	Policy intervention type:	Competitiveness – physical capital; environment – physical capital
A.4	Objective of instrument:	Improving the productivity of physical capital, to improve farms' economic performance through better use of production factors including new technologies, innovation, targeting quality, organic products and farm diversification into non-food sectors and energy crops as well as improving environmental, safety and welfare standards.
A.5	Indirect effects	Will enable farmers to adopt new technologies, potentially hastening decline in farm employment but also offering potential for specialisation, or diversification.
A.6	Targeting, eg defined:	Defined only by sector at EU level. In many countries this is not otherwise targeted and funds are awarded on a first come, first served basis. A few programmes target by geography and other criteria (eg environmental and welfare standards only). Support is in the form of 'tangible or intangible' investments including plant, machinery, licences and equipment. Used to be subject to eligibility criteria on the basis of detailed tests of business viability. Under EAFRD it must improve overall performance of the holding, and if the young farmer grant rate is involved, it must be linked to a business plan under the young farmer support scheme.
	Sectorally	
	Geographically	
	In respect of human criteria	
A.7	Method of delivery:	Investment aid – grants approved in advance, paid once work is completed, direct to final beneficiary. Maximum aid percentages are specified: 40% in most cases, 50% for farmers in LFA areas and 10% higher for young farmers, in both cases. A special provision for new MS offers 75% where investment supports achieving nitrates Directive standards, for 4 years from date of accession.
A.8	Extent of past experience with instrument in the EU:	Longstanding use by most EU15 MS since late 1970s. Largest single element in many new MS programmes for 2004-6 and 2007-13. 22% of axis 1 spend, 2000-06, 29.6% for 2007-13. UK and Sweden almost ceased use in 1990s, partly due to evaluations suggesting high deadweight.
A.9	Corresponding CMEF result and impact indicators:	R = no of holdings introducing new products or techniques, increase in GVA per supported holding I = economic growth, labour productivity
A.10	Single cell, multiple cells or joint cell in table 5.2? (assess and describe relation to other instruments)	Mainly in one cell in the table – private physical capital for competitiveness, but within only one sector: agriculture. Also includes aids suitable for investments to enhance sustainability, but again only for farmers. Rationale is generally that this sector faces particular barriers to achieving successful investment through market mechanisms.
A.11	Linkages to other RD measures:	Closely linked to support for young farmers in many cases. Similar purposes to investment aid offered to non-farm businesses under micro-business measures in axis 3. May be usefully coupled with appropriate training and advice, as well as adding value, to maximise value.
A.12	Linkages with other EU (non-CAP) funding sources:	Some MS offer limited support for specific sectoral investments under state aid rules, usually in response to particular crises or shocks from unpredicted sources. Where investments are not agricultural, ERDF can fund.
	Part B: Relation to EU policy objectives	

B.1	Corresponding guidelines(s) or key action(s) from the EU Strategic Guidelines for Rural Development	Promoting competitiveness in farming and forestry To a lesser extent, supporting environmental land management by providing environmental investment to maintain standards.
B.2	Potential to respond to other EU priorities (specify)	Lisbon agenda, can be used to promote Goteburg also.
	Part C: Resources Needed	
C.1	Resources for delivery.	This measure provides resources for grants and soft loans to facilitate investment for modernisation, on holdings. Administration requires some method to check the potential for the investment to improve holding performance, and inspections to ensure work has been carried out to approved standards, before grants are paid. It is a relatively high cost measure per beneficiary, although the administrative cost varies considerably depending upon how much of the necessary advisory support for preparing applications and planning the work is funded under other policy measures. Due to limited policy reach, targeting is advisable to maximise additionality.
	Part D: Effectiveness	
D.1	Effectiveness of instrument:	Low to potentially high. Evaluations of this instrument over many years and in many different MS suggest that it can be very effective at improving business performance and stimulating modernisation of farm technologies and specialisation in production. However there are important issues also – high deadweight can occur in relatively low-interest, stable economic conditions and where most farms already have significant asset value (so banks would lend to them). Conversely where these conditions are not fulfilled, finding the required private match-funding may be difficult for small farms with few assets. Accessibility is known to be a problem for small farms and support from targeted advisory services is necessary to help overcome barriers to access. Some criticise its encouragement for farmers to capitalise and take on (large, long-term) debts, while others suggest that the facilitation of private sector loans would be more cost-effective and send a more appropriate signal to farmers.
D.2	Potential causes of policy failure:	Where schemes are untargeted according to real needs, where schemes are so complex to access that only those who least need the aid can afford to invest the effort to put in a successful application, and where the advisory effort which supports the case for the investments is insufficiently sensitive to sustainability needs and concerns. In respect of environmental investments, there is a risk that farmers will prefer high-cost, high tech solutions to meeting standards which then require highly intensive production to maintain a sufficient income stream with which to repay the private loan component of the investment, thus weakening the ultimate value of the changes made. Maximum grant rates may be inadequate where the main purpose of investment is environmental (even when not strictly non-productive, thus ineligible for measure 216 / 227 under axis 2).
	Part E: Recommendation	
E.1	Overall assessment:	This is undoubtedly a useful instrument if appropriately targeted by sector and geography to meet specific needs and address proven barriers to modernisation or environmental enhancement, or specifically to promote innovation. However because policy reach is limited,

		prioritisation and targeting are needed to ensure cost-effective use. Integrated use as part of wider, locally or sectorally conceived projects and initiatives is likely to bring the greatest benefit whereas first-come, first-served untargeted assistance is unlikely to deliver additionality.
E.2	Recommendation:	Retain, find ways to encourage more integrated and targeted use without unduly constraining the purposes for which aid can be given, or the precise details of how the aid should work. Consider replacing some grant aid with loans or a service which locates private sector investment funding, for would-be agricultural modernisers, to increase cost-effectiveness. If use across axes were permitted, consider merging with similar measures in axes 2 and 3 (220 and microbusinesses) and using a sliding scale of maximum grant according to the degree of public benefit, as opposed to private benefit, involved (see section 6).

5.1.3 Results from previous evaluations and other studies

Investment aids provided through the farm modernization measure enable farmers to restructure and develop their holdings, which can lead to efficiency and productivity gains, mainly for ***labor and land productivity***. Thus their results include increased ***output per hectare and per worker***, and increased ***business turnover*** (Dwyer *et al.* 2008a, page 95).

The ***number of created or maintained jobs*** in assisted enterprises is also sometimes described as an objective of farm investment aid (Meyer 2006). Other authors (Bergschmidt *et al.* 2008b) argue that this aspect is not a primary objective of farm investment aid but often analyzed in the evaluations (due to the importance of employment in general) and positive effects are often reported (Agra CEAS 2005, Collado Cueto 2006, page 114). However, positive employment effects are not consistent with the economic logic of the instrument. Due to lower capital costs, in a large share of the supported investments, labour is substituted by capital, at least in the short run (substitution effect). In the long run the number of jobs may increase again due to rising productivity, competitiveness and rising outputs of the firm (output effect) (Meyer 2006).

(Bergschmidt *et al.* 2008b) conducted the ex post evaluation of the farm modernization scheme 2000-2006 in the federal state of Brandenburg, which is one of the five SPARD case study regions. From a total investment volume of 201 Mio Euro (46 Mio Euro public expenditure), 61% was spent for investments in agricultural buildings (29% for cattle sheds, 10% for pig pens, rest other investments in buildings), 23% went to machinery and equipment, 14% to environmental investments (including photovoltaic systems, biogas plants)

and the rest to other measures (e.g. young farmers aid 2%). Due to insufficient data (missing or incomplete accounting records, no time series), the authors conducted written and telephone interviews in combination with model-based analyses.

The interviews among the beneficiaries[11] in Brandenburg (before-after comparison) indicated that ***labor productivity*** (87% of the surveyed farms)***, working conditions*** (85%), ***product quality*** (75%) as well as the ***farm income*** (75% positive or strongly positive, 13% however also slightly negative) were positively influenced by the investment aid. (Bergschmidt *et al.* 2008b) also found that the employment in supported farms had decreased by 13% (except for one farm that expanded production after the investment leading to 40 additional full employees). 65% of the surveyed farms had the opinion that the investment had somewhat lowered production costs, 67 % felt positive impacts on economic growth.

The authors found that the investments with environmental motivation (mostly machinery for improved slurry and pesticide application) were not very well targeted, a real impact assessment, however, was not possible due to lack of data. In addition, they reported ***positive impacts on animal welfare*** in the dairy sector (more space per animal) and ***negative impacts in the pig sector*** as the investments usually involved building fully concrete slatted floor pens.

A study in Belgium (Beck & Dogot 2006), also based on questionnaires (n =17), found that the primary motivation for investment was improvement of working conditions (time saving for milking, feeding, better monitoring of animals, reduced stress and improved well-being for the animals) and to maintain the farming activity, and only to a lesser extent the improvement of farm income.

[11] Interview sample size: 65 farms (= 4.1% of all beneficiaries); only farms with an investment volume of more than 100.000 Euro were included; in total 1.586 cases were supported during the period 2000-2006

Table 11: Summary of the mid-term evaluation results (2000-2006) regarding the measure "investments in agricultural holdings" (Agra CEAS 2005)

Evaluation question	**Cross-country comparison**[12]	**Primary objective**	**Side-effect**[13]
Farm income	29 % positive 43 % too early for impacts to be felt 29 % no meaningful answer possible		X
Use of production factors	29 % positive 29 % too early for impacts to be felt 43 % no meaningful answer possible	x	
Re-orientation of farming activities	25 % positive 26 % mixed (circumstances, region) 13 % no change 38% no meaningful answer possible	x	
Quality of products	14 % positive 29 % mixed according to region 29 % too early for impacts to be felt 29 % no meaningful answer possible	x	
Maintenance of employment	38 % positive 26 % mixed (circumstances, region) 38 % too early for impacts to be felt		X
Environmentally friendly farming	63 % positive 13 % mixed according to region 25 % no meaningful answer possible	x	
Working conditions/animal welfare	43 % positive 14 % mixed according to region 29 % too early for impacts to be felt 14 % no meaningful answer possible		X

[12] Different sample sizes, as not all countries answered all questions

[13] According to the authors of the synthesis report

5.1.4 Current legal basis

Council Regulation (EC) No 1698/2005 of 20 September 2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD)
Source: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32005R1698:EN:NOT

With regard to physical potential, a set of measures on the modernisation of agricultural holdings, improvement of the economic value of forests, adding value to agricultural and forestry products, promoting the development of new products, processes and technologies in the agriculture and food sector and in the forestry sector, improvement and development of agricultural and forestry infrastructure, restoring agricultural production potential damaged by natural disasters and introduction of appropriate prevention measures should be made available

(21) The purpose of Community farm investment aid is to modernise agricultural holdings to improve their economic performance through better use of the production factors including the introduction of new technologies and innovation, targeting quality, organic products and on/off-farm diversification, including non-food sectors and energy crops, as well as improving the environmental, occupational safety, hygiene and animal welfare status of agricultural holdings, while simplifying the conditions for investment aid as compared with those laid down in Council Regulation (EC) No 1257/1999 of 17 May 1999 on support for rural development from the European Agricultural Guidance and Guarantee Fund (EAGGF) [3].

Article 26
Modernisation of agricultural holdings
1. Support provided for in Article 20(b)(i), shall be granted for tangible and/or intangible investments which:
(a) improve the overall performance of the agricultural holding; and
(b) respect the Community standards applicable to the investment concerned.

Where investments are made in order to comply with Community standards, support may be granted only to those which are made in order to comply with newly introduced Community standards. In that case, a period of grace, not exceeding 36 months from the date on which the standard becomes mandatory for the agricultural holding, may be provided to meet that standard.

In the case of young farmers receiving support provided for in Article 20(a)(ii), support may be granted for investments to comply with existing Community standards, when identified in the business plan referred to in Article 22(1)(c). The period of grace within which the standard needs to be met, may not exceed 36 months from the date of setting up.

2. Support shall be limited to the maximum rate laid down in the Annex
Article 88
2. Aid for modernisation of agricultural holdings which exceeds the percentages set in the Annex, as regards Article 26(2), shall be prohibited. This prohibition shall not apply to aid for investments relating to:

(a) investments undertaken predominantly in the public interest and related to the conservation of traditional landscapes shaped by agricultural and forestry activities or to the relocation of farm buildings;
(b) the protection and improvement of the environment;
(c) improvement of the hygiene conditions of livestock undertakings and animal welfare and those with regard to occupational safety at the workplace.

Annex
26(2) | Intensity of aid for the modernisation of agricultural holdings | 60 % | Of the amount of eligible investment by young farmers in the areas referred to in Article 36(a)(i), (ii) and (iii) |

	50 %	Of the amount of eligible investment by other farmers in the areas referred to in Article 36(a)(i), (ii) and (iii)
	50 %	Of the amount of eligible investment by young farmers in other areas
	40 %	Of the amount of eligible investment by other farmers in other areas
	75 %	Of the amount of eligible investment in the outermost regions and the smaller Aegean Islands within the meaning of Regulation (EEC) No 2019/93
	75 %	Of the amount of eligible investment in the Member States which acceded to the Community on 1 May 2004, for the implementation of Council Directive 91/676/EEC within a maximum period of four years from the date of Accession pursuant to Articles 3(2) and 5(1) of that Directive

5.1.5 Guide for the analysis in SPARD

Table 12: Catalogue of questions guiding the spatial econometric analysis (121)

Questions guiding the analysis	***Answer***
What is the spatial distribution of the measure in the EU (hot spots)?	2nd most important measure after 214. 10.6% of total public budget allocated (15.7 billion including EU and national contribution). The measure is offered in all 27 EU member states. Relative share in total public RD budget ranges from 51% (Belgium) to less than 3% in Ireland.
Is the measure likely to have spillover effects?	The investment is limited to participating farms. to participating farms, it could create some effects to neighboring regions. The investment for measure 121/modernising farm holdings would provoke reduced labor intensity and thus, would decline the demand for labor. This could turn out to be higher supply of labor in the neighboring regions. Thus, farms in neighboring regions would move to more labor intensive production process following an increased supply of labor because increase in supply generally reduces the wage. Displacement effects are also possible.
Is the chosen spatial scale (NUTS2, RDP region) appropriate (area-root-problem)?	The programming region is generally appropriate for the analysis. Assumption: differences between regions will be due to differences in programs (as a political response to the different regional needs).
What factors influence the performance of the measure (possible explanatory variables); to correct for the size of the regions, the use of per-capita figures is meant where useful?	• Intensity of aid per beneficiary • Total investment volume (can set incentives to over-investment) (Bergschmidt *et al.* 2008a) on average, interaction term of R&D expenditure and total investment volume. R&D expenditure would be a proxy for innovation initiatives. Thus, this interaction term would have more significant influence on the measure than only investment volume • Object of investment (buildings, machinery, diversification), if a farm receives investment support for different measures, it could also affect the performance. For example, money received for Axis 3 (e.g. 311) would have negative effect on the performance of the measures of Axis 1 (e.g. 121). So the ratio of two measures may explain the performance, ratio of labor-extensive (arable) vs. labor-intensive investments (livestock) • Farm size, bias towards larger farms (Agra CEAS 2005, example Czech republic) • Framework conditions (market prices, rental prices[14], interest rates) • Ratio of public vs private expenditure • Ratio of private costs borne by the beneficiary/total eligible costs (Dwyer *et al.* 2008a, page 85) • Investment distribution (ratio of small vs. large investments) • Economic development of non-agricultural sector might have a spill-over effect, so GVA in secondary and tertiary sector could also be a explanatory variable, or perhaps: labor productivity in

[14] High rental prices for land may lead to increased land acquisition, thus reducing liquidity for other investments, resulting in a low uptake of investment schemes (Eastern Germany (Bergschmidt *et al.* 2008b), Lithuania (Agra CEAS 2005)).

	the secondary and tertiary sectors (to correct for the size of the region) • dominant agricultural activity of the region would also influence the performance of the measure
Possible impacts	Drivers: - +Total factor productivity (modulation study) - +Capital productivity (modulation study) - +Factor payment capital (modulation study) - ++Fixed assets (modulation study) - +Water Quality (modulation study) - +Soil Quality (modulation study) - +Climate Change (modulation study) - +Quality Of Life and Rural Vitality (modulation study) - +Liquidity (Bergschmidt *et al.* 2008a) - +Labor productivity (Bergschmidt *et al.* 2008b) - -Employment (Agra CEAS 2005) - +Farm income (Agra CEAS 2005) - +Diversification, depends on type of investment[15] - +Working conditions (Beck & Dogot 2006) - +Product quality (Agra CEAS 2005) - Counterproductive to area-based extensification of axis 2, e.g. grassland extensification programs vs. intensive pig production, biogas plants vs. increase of silage maize in cropping pattern, no set aside (Agra CEAS 2005) - +Animal welfare (dairy) (Bergschmidt *et al.* 2008b) - –Animal welfare (pig pens) (Bergschmidt *et al.* 2008b)
Unintended effects	Displacement effects (increased competitiveness of supported farms has adverse effects on non-supported farms) Deadweight effects (investments would have also been made without aid) (Meyer 2006)
Measurement	
Time lag between investment and impact	At the earliest, 2-3 years after the investments (Bergschmidt *et al.* 2008a, page 12) (Beck & Dogot 2006, however, found no significant impacts in Wallonia three years after the investment and ascribed this result i.a. to the too short time span)
Counterfactual (control groups)	Old EU: usually only before-after comparison, no real counter-factual possible (example Niedersachsen: no farms without investment aid in the past decades available) (Bergschmidt *et al.* 2008a) Control groups: perhaps only in new member states, eastern Germany

According to (Meyer 2006), who compares different methods for evaluating farm investment support, possible dependent variables in the context of investment support could be the ***volume of investment***, the ***competitiveness of investing firms*** or the ***employment impact***; explanatory variables could be the ***interest rate, earlier earnings***, the ***expected demand***, and ***the size of the enterprise.***

[15] In the period 2000-2006, diversification into non-agricultural activites was part of the farm investment aid!

5.1.5.1 Corresponding CMEF indicators (121)

Indicator	Measurement/unit	Scale	Year	Data records
Baseline lead indicators (objective-related)				
Labour productivity in agriculture	Gross Value Added per annual work unit (GVA/AWU)	N2	2006 (change 2000-2006)	182-216
Gross fixed capital formation in agriculture	Gross fixed capital formation in agriculture (Mio. Euro)	N2	2006 (change 2000-2006)	161-177
Baseline lead indicators (context-related)				
Designation of rural areas	Designation of rural areas according to the OECD methodology	N2	2001	271
Importance of rural areas	This indicator consists in 4 sub-indicators (% territory in rural areas, % population in rural areas, % Gross Value Added in rural areas, % employment in rural areas)	N2	2006	105-195
Agricultural land use	% Utilised Agricultural Area in arable area / permanent grass / permanent crops	N2	2006	271
Farm structure	This indicator consists in 5 sub-indicators: (Number of farms, Utilised agricultural area (Ha), Average area farm size (Ha) and distribution (%), Average economic farm size (ESU) and distribution (%), Labour force (AWU))	N2	2007	271
Forestry structure	Area of forest available for wood supply (FAWS)(Ha), Ownership (% area of FAWS under "eligible" ownership), Average size of private holding (FOWL) (Ha)	N2		n.a.
Forest productivity	Average net annual volume increment (FAWS) (1000m3 overbark / year / ha of FAWS)	N2		n.a.
Input indicators				
Expenditure	Amount of public expenditure realised (total versus EAFRD)	M(C)	2007-2013	1 (planned expenditure)
Output indicators				
Beneficiaries	Number of farm holdings that received investment support (division according to gender, legal status, age category, type of investments – FADN- and type of agricultural branch)	M(RDP)	2007-2013	85 (targets)
Volume of investment	Total volume of investment (division according to the type of investment –FADN- and type of agricultural branch)	M(RDP)	2007-2013	86 (targets)
Result indicators				
Change in GVA	Increase in gross value added in supported holdings/enterprises	M(RDP)	2007-2013	72 (targets)
Successful beneficiaries	Number of holdings/enterprises introducing new products and/or techniques	M(RDP)	2007-2013	77 (targets)
Impact indicators				
Economic growth	Net additional value added expressed in PPS (Purchasing Power Standard)	RDP	2007-2013	46 (targets)
Labour productivity	Change in Gross Value Added per Full Time Equivalent (GVA / FTE) (Euros per Full Time Equivalent)	RDP	2007-2013	42 (targets)

N2= NUTS2 (n=271), M=measure, RDP=rural development plan (program, n=88), c= country, n.a. not available (09/2010)

5.2 Agri-environment measures (214)

5.2.1 History

Agri-environment measures (AEM) are a mandatory component of the RDPs. The majority of AEM targets actions and not environmental results. Farmers commit themselves, usually for a five-year minimum period, to adopt environmentally friendly farming practices that go beyond usual good agricultural practice. In return they receive payments that compensate for additional costs and loss of income that arise as a result of altered farming practices (COM 2005a). Types of agreement include input-reducing measures, such as adaptations of crop rotations, reduced fertilizer and pesticide rates or organic farming, landscape and habitat measures, and other measures, such as raising endangered domestic breeds of animals. Input-reducing AEM are of particular importance in terms of enrolled area in intensive agricultural regions in the EU, while landscape- and habitat-related measures are of greater importance in extensive agricultural regions.

Agri-environmental policy in the EU started in the 1980s. The 1985 European Structures Regulation (797/85[16], Article 19) allowed the member states to introduce AEM which contributed towards the introduction or continued use of agricultural production practices, while being compatible with the requirements of conserving the natural habitat, and ensuring an adequate income for farmers (Hodge & Reader 2009). The Netherlands, for example, introduced AEM in 1981 (Kleijn et al. 2001), at this time however purely financed by the national governments, the UK in 1987 (Hodge & Reader 2009). Examples of early programs in Germany[17] are programs for conservation of wetland meadows, floodplains, middle-mountain ranges and the creation of field margins. In 1992, with the MacSharry reforms of the CAP, Council Regulation EC No. 2078/92 introduced AEM as 'accompanying measures' to the existing CAP instruments. The Agenda 2000 reform in 1999 brought along a further re-direction of agricultural budget spending away from production and towards environmental payments and direct income support. The implementation of agri-environmental measures became mandatory for all EU member states. While the first phase of measures mainly focused on restraining intensification and mitigating environmental harm resulting from

[16]Council Regulation (EEC) No 797/85

URL: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31985R0797:EN:HTML

[17]http://www.lanuv.nrw.de/veroeffentlichungen/loebf/loebf_mitteilungen/2005/200504_web/loebfmit_200504_S181-251.pdf

intensification, later AEM have shifted towards explicitly promoting environmental enhancement (Hodge & Reader 2009).

5.2.2 Terminology

The EU terminology differentiates between agri-environmental programs, schemes and measures (COM 2005a). An agri-environmental program is a collection of agri-environmental schemes implemented in a country. Individual schemes have different objectives (e.g. grassland extensification or conservation of endangered livestock breeds) and can be broken down into specific measures or types of operations (e.g. grassland extensification measures, input-reducing measures). Sometimes types of operations are also referred to as management prescriptions (Kleijn & Sutherland 2003). For example, in the case of a grassland extensification scheme, management prescriptions may consist of a reduction in stocking densities or a reduction of fertilizer inputs. However, the distinction between measures, programs and schemes depends on the context and is not always entirely clear or the use of these terms is country-specific. Studies from the United Kingdom, for example, prefer the term ‘schemes’ and speak less often of ‘measures’. In Germany, the literature often makes no clear distinction between measures and schemes. The term ‘measures’ is the preferred expression for both levels.

To describe schemes of different intensities, studies from the UK speak of low-tier and high-tier options. In Germany, it is more common to speak of top-up measures to describe high-tier options, while low-tier options are referred to as ‘basic measures’. Some authors refer to AEM as subsidies. This annotation is perhaps correct in a theoretical economic sense but not according to the classification made by the WTO, which lists AEM as non-trade distorting measures (Potter & Burney 2002). WTO criteria for differentiating AEM from subsidies are (i) that the provision of the value is regarded as an external benefit (Provider Gets Principle applies), (ii) presence of market failure, environmental value would not be provided without the payment, (iii) causal link between action and outcome, and (iv) that the policy mechanism is targeted on the most appropriate indicator (Hodge 2000).

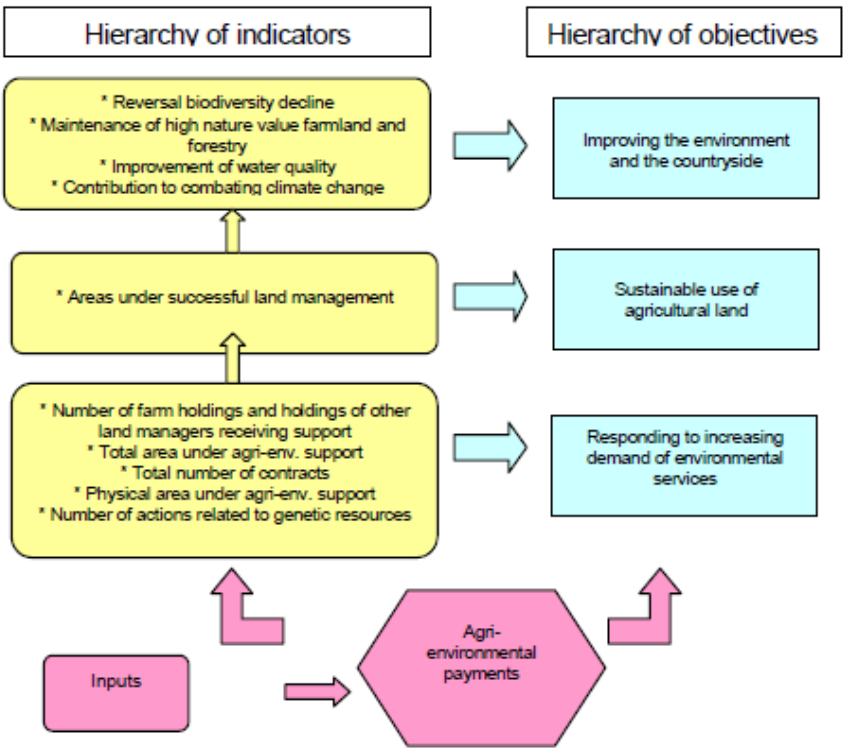
Link rationale of the measure and indicators	
Evaluation questions	To what extent have agri-environmental measures contributed to maintaining or promoting sustainable farming systems? To what extent have agri-environmental measures contributed to maintaining or improving habitats and biodiversity? To what extent have agri-environmental measures contributed to maintaining or improving water quality? To what extent have agri-environmental measures contributed to maintaining or improving soil quality? To what extent have agri-environmental measures contributed to mitigating climate change? To what extent have agri-environmental measures contributed to maintaining and improving landscapes and its features? To what extent have agri-environmental measures contributed to improving the environment? Distinguish between the contribution of agri-environmental measures implemented as demanding, site-specific measures and less demanding measures which are widely applied.

Figure 13: Intervention logic of the measure 214[18]

[18] http://ec.europa.eu/agriculture/rurdev/eval/guidance/note_e_en.pdf

5.2.3 Fiche provided in the review of RD instruments

Source: (Dwyer *et al.* 2008b)

	Part A: Description	
A.1	Title of instrument:	**Agri-environment payments (AEM)**
A.2	Existing instrument or new instrument:	Existing instrument "*Improving the environment and the countryside*" (214)
A.3	Policy intervention type:	Environmental sustainability: *Natural capital, human capital, cultural, financial capital*
A.4	Objective of instrument:	To improve the environment and the countryside, to maintain and promote sustainable use of agricultural land and thereby respond to increasing demand for environmental services.
A.5	Indirect effects	To increase public and private protection and enhancement of environment (biodiversity, water, soil, landscape) among farmers. To increase awareness of environmental issues and priorities among farmers, raise the supply of organic products, reduce intensity and output in some cases.
A.6	Targeting, eg defined:	There is an extremely great variety of measures, sub-measures and schemes offered to farmers, some are geographically targeted and some are horizontal. Target group: each farmer who makes on a voluntary basis AE commitments going beyond the relevant mandatory Community and national standards is eligible for regular payments. But some eligibility criteria exist: minimum farmed area / number of LU, cross-compliance, continuous agricultural activities, targeted crops or land use. MS also define additional administrative or environmental requirements, e.g. registration in agricultural or organic farming register, preparation of protection plans, obligatory participation in other AEMs or obligatory attendance at training.
	Sectorally	
	Geographically	
	In respect of human criteria	
A.7	Method of delivery:	Due to great variety of measures – delivery for some mainly horizontal AEMs is relatively simple, and involves the completion of an application form, reviewed by the payment agency. But delivery and implementation for other, mostly targeted AEMs is more difficult and needs more sophisticated judgment on farm (contractual approach) by skilled assessors.
A.8	Extent of past experience with instrument in the EU:	Authorization for Member States to introduce national schemes to compensate farmers for practices compatible with the requirements of conserving natural habitat in environmentally sensitive areas was provided as early as EC Reg. 797/85. Obligatory implementation of AEMs began in 1992. The 2nd generation of AEMs was initiated in 2000 through Reg. 1257/1999. Widely used: 58% of axis 2 EU spend, 2000-06, and 49.1% planned for 2007-13.
A.9	Corresponding CMEF result and impact indicators:	(R) Areas under successful land management contributing to improvement of biodiversity, improvement of water quality, mitigating climate change, improvement of soil quality, avoidance of marginalisation and land abandonment. (I) Reversing biodiversity decline, maintenance of High Nature Value farmland and forestry, improvement in water quality and contribution to combating climatic change.
A.10	Single cell, multiple cell or joint cell in table 5.2	Regular payments, 10 skills for environmental sustainability, 13 promoting environmental resources, 14 climate change mitigation
A.11	Linkages to other RD measures:	AEMs are closely linked to Natura 2000 payments (213) since mostly the same approach is used, but supported management obligations are non-compulsory for AEM. Some similarities with the LFA Measure. However, although

		the objectives of both measures are similar, their targeting differs. Support for non-productive investments is complementary to the regular management supported by AEM.
A.12	Linkages with other EU (non-CAP) funding sources:	The instruments shares similarities in objectives with instruments implemented under ERDF, e.g. larger investment projects supported under Operational Programmes for Environment and Infrastructure.
	Part B:	**Relation to EU policy objectives**
B.1	Corresponding guidelines(s) or key action(s) from the EU Strategic Guidelines for Rural Development	In particular, contributes to priority area of biodiversity, preservation of High Nature Value farming, protection of water and climate change mitigation. AEMs contribute to actions to promote environmental services, maintain landscape and habitats, promote territorial balance and attractiveness of rural areas.
B.2	Potential to respond to other EU priorities (specify)	to improve sustainability, in line with the Göteborg Commitment to Halt Loss of Biodiversity by 2010, to contribute to goals of Community action in the field of water policy (Water Framework Directive 2000/60/EC), to contribute to climate change mitigation within the goals of the Kyoto Protocol.
	Part C:	**Resources Needed**
C.1	Resources for delivery.	AEMs like broad / shallow measures are a difficult RD instrument in all steps of the policy cycle (design, implementation, evaluation) and require significant administrative expenses (transaction costs) on the state side. However, required resources are mostly defendable regarding expected outcomes, mainly if AEMs are correctly established. Considerable investment in institutional capacity is required, with monitoring essential and advice/delivery support very desirable.
	Part D:	**Effectiveness**
D.1	Effectiveness of instrument:	This varies between the large number of approaches. Moderate for the broad / shallow AEMs with general requirements, and could drop to low if the support offered to farm incomes exceeds environmental requirements and outcomes are modest. Potentially very high for the most narrow / targeted AEMs since designed management corresponds more precisely to type of habitats/ precise needs. On the other hand the risk of improperly designed management is higher, in which case only moderate impact might result. The take-up of higher tier measures is limited in most MS by budgets or farmer perceptions, reducing their effectiveness.
D.2	Potential causes of policy failure:	Targeted, more effective, AEMs are administratively intensive and since they bring mostly significant changes they are also less accepted by farmers. The more difficult AEMs, the more assistance, advice or consultancy are needed to ensure effective implementation. Good targeting is endangered by the lack of scientific data/knowledge for design and by difficult monitoring and evaluation of impacts, to help in improving the measure.
	Part E:	**Recommendation**
E.1	Overall assessment:	AEM are a very valuable instrument, able to address all the relevant objectives and should remain the same in most of their aspects. Some supporting activities should be

		developed to ensure AEM efficiency in future (see below).
E.2	Recommendation:	The existing instrument should be maintained (there is no measure that could be a sufficient replacement) but improved. The improvement should focus on weaknesses: improve the scientific data needed for measure design, records facilitating implementation, strengthened provision of advisory services and linked training, enhanced monitoring and evaluation knowledge/experience. In some cases targeting could be improved, e.g. at HNV farming systems, and administrative changes may be required to ensure broader environmental benefits at the landscape scale. Finally, consideration should be given to linking payment more closely to outcomes rather than management obligations, and to changing the explicit rationale for payment calculation towards positive payment for environmental goods and services.

5.2.4 Results from the literature

From the three selection RD measures considered in this report, agri-environment measures are by far the best researched. The literature review is therefore more extensive compared to the other two measures. The majority of the articles analyze empirically ecological and economic effects of agri-environmental measures from field experiments, the analysis of monitoring data (quasi-experimental), or farm surveys, usually in combination with some statistical analyses (Bullock *et al.* 2007, Holland *et al.* 2008).

A further important research issue is the cost-effectiveness of AEM (Drechsler *et al.* 2007a, Drechsler *et al.* 2007b, Wätzold *et al.* 2008). Improved spatial targeting (e.g., Bayliss *et al.* 2006, van der Horst 2007, Piorr *et al.* 2009) and changes in the contract design, such as payments by results (Bertke *et al.* 2008, Matzdorf *et al.* 2008, Matzdorf & Lorenz 2010), and auctions (Latacz-Lohmann & Van der Hamsvoort 1997) are frequently-discussed strategies to improve the cost-effectiveness of schemes. Another important focus is the identification of factors influencing farmers' participation attitudes (Defrancesco *et al.* 2008, Sattler & Nagel 2010) and the institutional environment in which AEM are embedded (Arzt *et al.* 2003, Vandermeulen *et al.* 2006, Beckmann *et al.* 2009), including participatory approaches to decision-making (Prager & Nagel 2008, Prager & Freese 2009).

Another group of articles deals with the challenge of optimal budget planning and priority setting between the schemes bundled in agri-environmental programs (Kirschke & Jechlitschka 2003, Kirschke *et al.* 2004, Kirschke *et al.* 2007)

Few articles deal with one topic only, most deal with multiple factors playing a role in the programming process of AEM. I have therefore grouped the articles based on their main focus and under consideration of the background of the authors if this information was known. Studies that did not fit directly to any of the categories above were summarized under the umbrella 'other studies'.

5.2.4.1 Impact assessment of agri-environmental measures

An EU-wide impact assessment of agri-environmental measures based on comparable indicators is not yet available due to scheme differences, differences in site factors and methodological problems (COM 2005b). Available empirical studies on AEM therefore usually focus on single schemes in different study areas. Most of them analyze the effects of schemes on biodiversity (mainly farmland birds, followed by grassland vegetation, and pollinators) with a regional focus on the United Kingdom, Germany, Switzerland and the Netherlands (e.g., Hanley *et al.* 1999, Hopkins *et al.* 1999, Donald & Vickery 2000, Critchley *et al.* 2004, Walker *et al.* 2007). Impacts on soil (Marriott *et al.* 2005, Deumlich *et al.* 2006), water (Hodge & McNally 2000, Granlund *et al.* 2005, Parrott & Burningham 2008), and air (Peerlings & Polman 2008) are less often addressed.

The experience with agri-environmental measures shows that they have "***patchy success***" (Sutherland 2004, Kleijn *et al.* 2006) depending on the schemes and indicators under investigation. There is some evidence that AEM reverse negative trends in bird monitoring data (Brereton et al. 2008), particularly in diversified, small-scale landscapes (Hopkins *et al.* 1999, Bullock *et al.* 2007, Edwards *et al.* 2007). AEM have effectively targeted suitable habitats in the UK (Carey et al. 2005), but were less successful in targeting erosive sites in Germany (Deumlich *et al.* 2006). Grassland extensification in Switzerland has had positive effects on pollinator species richness and abundance and pollination services to nearby intensely managed farmland (Albrecht et al. 2007). A study in the Netherlands found no positive effects on plant and bird species diversity, while hover flies and bees showed modest increases (Kleijn et al. 2001). Studies in intensively farmed regions usually reported less successful results and concluded that much more and different conservation efforts are needed (Herzog *et al.* 2005, Kleijn 2006, Kleijn *et al.* 2006). Available studies of impacts on abiotic resources reported unsatisfactory results (Granlund et al. 2005).

If the causes of environmental problems are not well studied and schemes therefore not appropriately designed, AEM can also have ***unintended effects***. Impacts on biodiversity, for example, are influenced by multiple factors, such as habitat quality, nutrient supply,

groundwater levels, forage availability, disturbances (scaring), and landscape structure. Kleijn et al. (2001) reported from a scheme in the Netherlands in which grassland extensification with delayed cutting caused a lower availability of food (soil invertebrates) for bird species. Birds consequently preferred conventional fields as forage areas. It was concluded that the lower food availability caused the birds to perceive such sites as poor-quality nesting habitat (despite a potentially higher survival rate of juveniles). The management prescriptions of the scheme were obviously not appropriately designed for the conditions in that landscape and the needs of that bird species, leading to a decoupling effect between nesting habitat and reproductive effect. Another example was given in Bro et al. (2004), who analyzed the biodiversity effects of wildlife cover strips. These authors found that, under certain circumstances, cover strips concentrate the number of species within small isolated areas and may therefore act as an ecological trap for prey species such as the grey partridge. A weak scheme design can also cause tradeoffs between different ecological objectives, e.g. between biodiversity and arboriculture (tree care) if the time of tree cuts overlaps with the breeding period of field birds (Bussler 2006).

Hodge and Reader (2009) criticize the failure of schemes in the UK to include prescriptions for maintaining hedges and ditches (Hodge & Reader 2009) and the lack of water level prescriptions included in wetland restoration program (Hodge & McNally 1998). In a later publication, these authors therefore recommend more room for collective actions to effectively control the water level in such programs (Hodge & McNally 2000).

Bisang et al. (2009) found that the implementation of AEM in Switzerland had caused a decrease in untilled autumn stubble-fields with negative impacts on hornwort populations.

Bailey (2007) reports as a negative effect that increasing connectivity networks, especially those with corridors, may function as conduits for undesirable species or disease spread. This invasion of habitats by nontarget species can compromise conservation goals (Baer et al. 2009). Invasion is promoted by legacies of disturbance, landscape factors, novel plant communities, and the absence of ecological drivers that historically maintained target communities (Baer et al. 2009) and also by climate change (Ausden & Fuller 2009).

5.2.4.2 Cost-effectiveness of agri-environment payments

Several studies have outlined the difficulties in estimating the benefits and costs of agri-environmental measures from empirical data (Primdahl *et al.* 2003, Kleijn *et al.* 2006, MacMillan & Marshall 2006, Matzdorf *et al.* 2008). Effects of AEM include maintenance

(e.g. preservation of the traditional landscape) and improvement effects (e.g. reduced contamination, habitat restoration) (Primdahl et al. 2003). The costs of AEM can be differentiated in private and public costs.

Problems in measuring conservation benefits result from a lack of linearity and immediacy of environmental effects, unequivocal causalities (effects are subject to a multitude of influences, only one of which is the policy to be evaluated), and often high costs of measurement (Primdahl *et al.* 2003, Kronvang *et al.* 2008).

The possibilities of estimating on-farm conservation costs including compliance and transaction costs are limited, for example, because access to spatial farm data is restricted for reasons of data protection (cf. Reidsma *et al.* 2006, Schmit *et al.* 2006). Estimates are usually based on farm surveys directly asking the farmers' willingness to accept (WTA) compensation (risk of exaggeration of costs), on standard gross-margin calculations (no spatial dimension of costs) and some top-up value to account for transaction costs.

To overcome data constraints and the methodological problems mentioned, model-based assessments have become increasingly relevant, particularly with the goal to support evaluation and better targeting of agri-environmental measures (Flury *et al.* 2005, Deumlich *et al.* 2006, Kersebaum *et al.* 2006, Drechsler *et al.* 2007a, Ohl *et al.* 2008, Wätzold *et al.* 2008, Piorr *et al.* 2009, Uthes *et al.* 2010a, Uthes *et al.* 2010c)

Four modeling strategies can be distinguished:

(1) Studies that focus on spatially heterogeneous benefits of conservation measures by estimating the spatial vulnerability for different environmental problems while neglecting conservation costs (Deumlich *et al.* 2006, Kersebaum *et al.* 2006). Such approaches make use of raster-based modeling of environmental processes and provide detailed insights into where measures should be conducted from a nature-conservation point of view, e.g., in areas with a high vulnerability for groundwater pollution or water erosion. Results are used to assess ex post the spatial equivalence of conservation measures (e.g., share of supported measures located in vulnerable areas). Since conservation costs are not considered, cost-benefit analyses at the political decision-making level or ex ante assessments are not possible.

(2) Studies that estimate spatially heterogeneous benefits AND costs of conservation measures but do not take into account farm-level decision-making (e.g., Wätzold & Drechsler 2005, Drechsler *et al.* 2007a, Wätzold *et al.* 2008). Benefits are usually estimated with ecological models (e.g., population models). Costs are usually based on the average income forgone (e.g., from published figures) and some expert-based top-up value to account for

transaction costs[19]. However, the decision-making units in these approaches (deciding whether to participate in a conservation program or not) are land parcels or other spatial units. In reality, land parcels are managed by farmers. The influence of farm structure on the magnitude of estimated on-farm costs is therefore not considered (for example, land parcels managed by extensive suckler-cow farms are more likely to "participate" in grassland extensification programs due to lower on-farm costs than intensive dairy farms).

(3) Studies that estimate spatial heterogeneous benefits AND include farm decision-making to estimate on-farm conservation costs but use a regional-farm approach (e.g., Flury *et al.* 2005, Paar *et al.* 2008, Schuler & Sattler 2010). A regional-farm approach assumes that an entire regional area is managed by a single farm. Production factors are aggregated at the regional level, whereas in reality production factors are heterogeneous among individual farms. As a result of the regional-farm assumption, conservation costs are typically underestimated. Differences in on-farm conservation costs between different farm types and the impact of different land qualities on on-farm conservation costs when managed by different farm types are also not considered.

(4) Studies using models based on farm type, operating at fine geographic resolution to assess both the spatial distribution of on-farm costs of conservation measures and also the distribution of on-farm costs among different farm types (Piorr & Müller 2009, Uthes *et al.* 2010c). These analyses deliver quantitative spatial information on both the distribution of agricultural opportunity costs and environmental effects to achieve joint economic and environmental benefits of natural resource management, as was argued by Bryan et al. (2009).

5.2.4.3 Factors influencing farmers' acceptance of agri-environmental measures

The attitudes of the participating farmers are important determinants of the extent of uptake in voluntary AEM and hence policy success (Falconer 2000). Another important focus in the existing literature is, therefore, the identification of factors influencing farmers' acceptance of AEM (Hanley *et al.* 1999, Siebert *et al.* 2006, Defrancesco *et al.* 2008, Sattler & Nagel 2010).

[19] Wätzold et al. (2008) analyzed costs and benefits of different mowing regimes to determine the optimal conservation level for butterflies. Conservation costs of the land units in the case study area were calculated based on three factors: (1) the average reduction in forage production under the different mowing regimes, (2) a top-up value for additional costs of 100 €/hectare (e.g, for acquiring information about the program), and (3) a random value between 50 and 200 €/hectare to account for differences in the attitudes of farmers toward participation in conservation program.

AEM will only be effective if they reach a scale that has impacts on environmental processes. If a highly effective measure is conducted only on a few hectares of land, environmental impacts will be marginal. However, it is not enough to determine the most suitable parcels of land (benefit targeting), it is also necessary to know what drives the decision-making process of farmers, the owners of these parcels, to contract for and comply with agri-environmental contracts (Hodge & McNally 1998).

Mazorra (2001) differentiates between scheme factors, such as management prescriptions, lack of policy coordination and competition from other CAP subsidies, and attitudinal factors such as farmers' skepticism and reluctance of the agricultural authorities. Other limiting factors are, for example, low payments (Brotherton 1991), the lack of training and education (Aughney & Gormally 2002), hostility, and the traditional perception of the farmers as producers of physical goods (Luetz & Bastian 2002).

Uptake is mostly determined by agricultural conditions, that is, farmers are adopting schemes that are most consistent with their particular circumstances (Hodge & Reader 2009); and is therefore more driven by the agricultural supply than by the demand for environmental changes. Uptake is also affected by increasing agricultural output prices. Since the programs are voluntary, farmers will face an incentive to withdraw their land from the scheme, unless the payment rates remain competitive (Hodge 2001).

Another effect, the selectivity effect, refers to the fact, that AEM have a bias towards bigger farms, who ‘can afford the luxury’ of enrolling land in AEM (Evans & Morris 1997, supported by recent analyses of Hodge & Reader 2009) due to economies of scale and comparatively lower transaction costs (Falconer 2000). The selectivity effect can also occur if a scheme targets landscape elements that are more likely to be found in certain farm types. There was evidence from the UK that targeting specific habitats, such as semi-natural rough grazing or woodlands, favored larger farmers, as they were more likely to have these habitats. As a result, larger farmers got more income from schemes, and even started to buy smaller family farms (Wilson 1997, Dobbs & Pretty 2001). Farmers on smaller holdings may also be older and less likely to have a successor (both of which are associated with lower rates of uptake), less well-educated and informed about schemes and, owing to financial constraints, less responsive to schemes (Hodge & Reader 2009).

Over time studies also found that, due to lower opportunity costs, peripheral, marginal and difficult-to-farm areas are first entered in schemes (Evans & Morris 1997). This implies that AEM are dominated by already relatively extensively farmed areas, while in intensively farmed regions higher opportunity costs usually prevent large-scale applications. This may

appear controversial, as from a nature conservation perspective, one would expect AEM to be best targeted on the most intensive sites. On the other hand, several authors explicitly recommend the targeting of extensive agricultural landscapes (Aviron *et al.* 2005, Dahms *et al.* 2009), since conservation benefits in such landscapes are usually higher. A general problem with the conclusion that AEM are more effective in extensively farmed regions is that most of the reported positive effects of AEM are maintenance effects. In extensively farmed regions, nutrients loads have historically always been lower. Maintenance of this state is therefore easier to achieve due to better starting conditions. In intensively farmed regions with often large parcels, lack of landscape elements, lacking connectivity between habitats (fragmentation), soils contaminated, and seed banks impoverished, the goal is not so much maintenance but improvement of environmental conditions. With these less favorable starting conditions, environmental effects are more difficult to achieve and at higher cost than in extensively farmed regions. Comparing maintenance and improvement effects is therefore not actually possible.

Another unintended effect is the slippage effect, which describes the phenomenon that farmers tend to enter less productive areas in schemes, while at the same time intensifying management of high potential areas (Evans & Morris 1997). The phenomenon may take place within one farm holding, but also between farms. Claassen et al. (2008) report that some US producers expanded cropland area, while others retired land due to participation in the conservation reserve program (CRP). A possible reason for this behavior is that other producers expand crop production in anticipation of supply reduction and commodity price rises induced by extensification resulting from AEM (Claassen et al. 2008).

Experiences with management agreements showed that enrolment in agri-environmental measures in the UK appears not to have affected the attitudes of farmers (Wilson 1997, Dobbs & Pretty 2001). Burton et al. (2008) also found that many AEM fail to allow farmers to develop or demonstrate "skilled role performance", meaning that that by prescribing some standardized operations to them, they are treated as if they are incapable of managing their land correctly. Thus they have only little motivation to take up AEM. Matzdorf and Lorenz (2010), in contrast, found positive impacts of payments by results to improve the knowledge of farmers about valuable grassland species.

Morris (2006) differentiates, in general, between state-led and farmer approaches to 'knowing nature'. Farmers are contesting AEM prescriptions and advice from AEM personnel, particularly if they feel that these prescriptions are not appropriate. A more general reason for this contesting behavior may be found in increasing environmental demand from the wider

society, which can alienate farmers. Morris (2006) calls, therefore, for more participatory and 'bottom-up' forms of policy-making, arguing that knowledge cultures transform and change over time and space including more negotiation and interchange between e.g. AEM personnel and farmers and that the farmers' voice is being listened to while also reducing moral hazard behavior.

5.2.4.4 Institutional environment

Another group of articles deals with the institutional environment AEM are embedded in (Arzt *et al.* 2003, Vandermeulen *et al.* 2006, Beckmann *et al.* 2009). Agri-environmental measures are developed in a complex legal framework with contextual guidance by the EU, and concrete regulations are worked out at the level of the Member States or – as in Germany – the federal states (Länder) (Prager & Freese 2009). AEM are the product of centralized, bureaucratic policy-making (Morris 2006) which is characterized by increasing anonymity, and a low level of transparency of decision-making processes (Arzt et al. 2003). Multiple actors are involved in the decision-making process on AEM at multiple scales, including government personnel at EU, national and regional level, lobby groups from agricultural, environmental and other non-governmental institutions, and research institutes. Egdell (2000) analyzed the 'information market' in the political decision-making process on AEM, and found that lobby groups had a significant impact on policy proposals but the type of impact differed due to some entrance barriers, such as the costs of involvement (Egdell 2000).

The inefficiency of AEM is often associated with the violation of two popular economic principles: that of subsidiarity and fiscal equivalence (Olson 1969). Subsidiarity means that the provision of goods and services should be administered at the lowest level feasible within the public interest (Ewringmann & Bergmann 2000). Fiscal *equivalence* expresses that each level of government should finance its assigned functions with funds it raises itself (Oates 1977). In the case of AEM, the common guidelines for implementation come from the EU, while the concrete design is the responsibility of authorities and agencies at regional level. The funding for AEM comes from three different sources (the majority from the EU, the national governments, and regional governments). This intertwinement of different decision scales has implications for the choice of schemes in the different member states, providing incentives to regional governments to design schemes that receive a high share of funding from other sources than their own budgets, or in EU terminology, to chose measures with a high co-financing share (Kirschke et al. 2007).

Morris (2006) calls for more participatory and 'bottom-up' forms of policy-making following the assumption that improved (fair) procedures, which include user feedback about agri-environmental measures, will improve both the information basis and the practice of decision-making processes (Prager & Nagel 2008). Over time, the respective council regulations have, therefore, increasingly encouraged member states to design agri-environmental policy in a sub-national, decentralized and participatory way (Beckmann et al. 2009). As a possible approach to decentralize agri-environmental measures, increase their flexibility but also to solve conflicts between actors, Arzt et al. (2003) suggested the development of innovative co-ordination mechanisms and co-operative structures, such as agri-environmental forums as a suitable approach for determining regional environmental objectives and appropriate schemes.

Examples of participatory approaches in this field include bottom-up agri-environmental planning and implementation in France (Dobbs & Pretty 2001), Landcare in Australia (Wilson 2004) and the Environmental Farm Plan Program (EFP) in Ontario, Canada (Prager & Nagel 2008). Prager and Nagel (2008, see also Prager & Freese 2009) analyzed empirically the possibilities of increasing the level of participation of actors in the decision-making on AEM in two regions in Germany. They report, that most actors involved in the decision making on AEM are in favor of further decentralization and participation in order to tackle agri-environmental problems. However, actors from the agricultural administration and agricultural associations, which are the most influential groups in terms of the design of AEM, opposed extending participation to the local level and to environmental associations, leading to a kind of 'David and Goliath situation' (Prager & Nagel 2008). Participant limits had to be respected so as not to endanger cooperation. Interviews with representatives of farmers' associations were open and frank, while in interviews with government personnel hierarchy played a major role. Loyalty towards superiors influenced the type of information given. The authors argue that participatory approaches can be integrated into administrative decision-making at state level but this process will take time and requires trust and flexibility, since established organizations approach innovations in a conservative manner for fear of loss of power and budget as well as disclosure of confidential information (Prager & Nagel 2008). Another reason why government agencies are often opposed to participatory approaches is that they might result in changes to existing practice. This can be costly, since maintenance of scheme management agreements is much less expensive than setting up new arrangements (Falconer & Whitby 1999). Good practice for participatory approaches implies that the participation capacities of local people (farmers but also other citizens) are taken into account. Variables such as trust, social capital, demands on time, past working relationships and the

interest in the issue at hand play a crucial role (White 2001, Prager & Nagel 2008). Moreover, stakeholders need to be taken seriously. General advantages of participatory approaches are that they reduce the risk that important aspects of a problem are overlooked as well as increased acceptance. Disadvantages of participation are potentially high costs, the time needed for it, the influence of hierarchies and that often results are not put into practice (Prager & Nagel 2008).

5.2.4.5 Budget optimization, priority setting and spatial targeting

Another group of articles deals with the problem of optimal budget allocation and priority setting in agri-environmental programming. Policy implementation in general deals with the problem that usually several options exist to achieve a desired political objective. If several policy measures can be implemented, which seems to be plausible for many policy-making problems, it needs to be evaluated how these measures can be compared to decide which measures should be implemented to what extent (Kirschke & Jechlitschka 2002, Jechlitschka *et al.* 2007). Kirschke and Jechlitschka interpret this situation as a classical budgeting problem. The problem is how a budget should be allocated among different policy measures to fulfill a set of political objectives in the best possible way (Kirschke & Jechlitschka 2002, Kirschke & Jechlitschka 2003, Kirschke *et al.* 2004, Jechlitschka *et al.* 2007, Kirschke *et al.* 2007).

This budgeting problem is translated into a matrix-based optimization approach using a system of linear mathematical equations. An optimization problem includes a number of possible activities, a number of constraints reflecting the available resources and conditions to be fulfilled and a number of coefficients defining how the objective function, which is to be maximized (or minimized), activities and constraints are interlinked (Chiang 1984). Kirschke and Jechlitschka's optimization approach maximizes the output for the policy objectives addressed by the measures considered. The solving algorithm has to determine how much budget should be allocated to individual measures, the activities, while respecting a number of constraints such as the available budget and the available area, or other constraints related to specific preferences of the decision-makers, such as upper or lower finance volumes for individual measures. Mandatory coefficients are expert-assessed goal contributions interlinking activities and objective function, and payment rates per measure (Euro per ha) interlinking activities and constraints (budget, area) (Jechlitschka *et al.* 2007).

The objective function of the optimization problem is described in equation 1.

(1) $$\max_{BE_1,\ldots,BE_n} Z = \alpha \sum_{i=1}^{n} z_{1i}\ BE_i + (1-\alpha) \sum_{i=1}^{n}\ z_{2i}\ BE_i$$

subject to

(2) $$\sum_{i=1}^{n} a_{rj} BE_i \begin{Bmatrix} \leq \\ = \\ \geq \end{Bmatrix} b_r \qquad \text{for r = 1,…..,m}$$

and

(3) $$BE_i \geq 0 \qquad \text{for i = 1,…..,m}$$

With Z - objective variable

i = 1,…..,n – index for the policy measures considered

BE - budget expenditure

α_1, α_2 - weights for the objectives

Results of the optimization problem are optimal goals levels for the objectives Z1 and Z2 and optimal budget expenditures for the policy measures i describing the priorities to be set to achieve Z1 and Z2 (Kirschke et al. 2007). The budget allocated to the measures in question as well as the size of the supported area of each measure are calculated in quantitative terms (Euro, hectares) derived from the constraints of the optimization approach. Goal levels are dimensionless (index sum) calculated from expert-assessed goal contributions of each measure multiplied with the optimal supported area of each measure. Other coefficients needed to fill the matrix are payment rates for each measure. The described approach can be used by decision-makers to negotiate the amount of budget to be allocated to individual measures and has been used in case studies in Germany and Poland (Kirschke *et al.* 2004, Jechlitschka *et al.* 2007, Kirschke *et al.* 2007, Ziolkowska 2009, Schmid *et al.* 2010). A particular focus of existing applications of the approach was on how optimal budget spending is influenced if funds come from different sources (e.g. from the EU, national and regional governments) (Kirschke *et al.* 2007). A region can, for example, maximize benefits from external (EU and federal) grants by shifting money into measures with higher external co-financing levels. The same measures become more attractive when regional funds become scarce (Prager & Nagel 2008).

A spatial extension to the above described approach has been developed by (Uthes *et al.* 2010a). The consideration of spatial heterogeneity in the provision of environmental impacts in the model shows that a re-allocation of funds to more effective measures can lead to considerable distributional effects between different administrative units, as they are usually not equally sensitive/vulnerable to environmental problems due to difference in natural (geo-bio-physical) characteristics.

5.2.4.6 Contractual design

Another group of articles deals with the contractual design of AEM. The majority of agri-environmental measures are management agreements (Hanley et al. 1999), prescribing a range of management activities which are assumed to lead to ecological effects. Since monitoring costs of result-based approaches and the risk and uncertainty of environmental outcomes may be high, AEM contract for the inputs over which farmers have control rather than to deliver the more uncertain environmental outputs (Hodge 2000). However, since not environmental outcome but compliance with management prescriptions is remunerated, there is some risk of non-provision of ecological effects.

Limits of existing agri-environmental contracts include the following issues (Hodge 2001):

- backward-looking perspective (focus on preserving traditional landscapes),
- contracts restrict the range of options (rules must be written down, monitored, enforced)
- provide incentives to evade contract requirements due to monitoring, enforcement, information costs as a results of imperfectly defined property rights,
- lack of incentive for entrepreneurship (no focus on outputs but on inputs and production processes),
- public resistance,
- changing attitudes towards the status quo of environmental standard to be provided, time for habitat development too short and point-focus of the measures, meaning that the measures have no ecosystem or landscape focus, but are often carried out on isolated patches;
- fall-back after program;
- opportunity costs of the measures are dynamic (e.g. in the case of rising market prices) capturing goodwill, acting as an incentive to threaten damage, to exaggerate costs (Hodge 2001).

These limits are often discussed with regard to issues of cost-effectiveness and efficiency of schemes (Drechsler & Wätzold 2007, Drechsler *et al.* 2007a, Wätzold *et al.* 2008, Matzdorf & Lorenz 2010). Maximizing the extent to which the objectives of AEM can be achieved entails designing programs to be cost-effective (Claassen et al. 2008).

Three reasons are often given why cost-effective AEM are needed. First, because the utilitarian regulator aims at maximizing the social welfare function, thus aiming at the highest welfare gain for public money possible (Moxey et al. 1999). Second, the enlargement of the EU to the east resulting in budgetary constraints and increasing pressure from the urban majority for more environmentally friendly agriculture (Fraser 1996). Third, international trade agreements which bring about the need for AEM to meet the requirements of the WTO's green box because only efficient AEM are considered non-distorting measures and thus will be allowed in future negotiations (Edwards & Fraser 2001).

Lacking cost-effectiveness can result from (i) non-optimal provision of conservation effects, e.g. due to non-optimal location of schemes, non-optimal uptake, and insufficient management prescriptions; (ii) from wrongly estimated program costs (on-farm costs leading to rents, unexpected monitoring and enforcement costs); or (iii) a combination of both.

Depending on the cause of lacking cost-effectiveness, different changes in the contract design of AEM are discussed, such as spatial targeting with a focus on benefits (van der Horst 2007), benefit-cost targeting (Claassen et al. 2008), payments by results (Bertke *et al.* 2008, Matzdorf *et al.* 2008, Matzdorf & Lorenz 2010), and auctions (Latacz-Lohmann & Van der Hamsvoort 1997).

5.2.4.7 Other studies

Another group of articles deals with specific methodological problems, such as the limitations of spatial data (Schmit *et al.* 2006), how to estimate on-farm conservation costs (Schuler & Sattler 2010), the use of GIS-based techniques for improved targeting and the development of indicators (Bastian *et al.* 2003, Hodgson *et al.* 2005, Matzdorf *et al.* 2008) to facilitate monitoring and evaluation of schemes. Finally, there are some articles that present the schemes of different countries (Banks & Marsden 2000, Mazorra 2001, Baylis *et al.* 2008) and experiences with the evaluation of them (Hodge & McNally 1998, Menge 2003). These studies provide valuable insights in the actual processes taking place in government bodies and farms explaining why certain strategies are not effective and thus accompany the articles written by ecologists and agricultural or environmental economists.

5.2.4.8 Conclusions

The field of studies on agri-environment payments is two-fold (Prager & Nagel 2008). On the one hand, natural scientists develop indicators and monitor ecological effects of AEM, while the social and economic sciences focus on the contractual design for AEM, impacts on farm economics, budget planning, participation in schemes, and the institutional environment. Economists tend to criticize ecologists for not making their implicit value judgments more explicit, while ecologists criticize economists for making simplistic and inappropriate assumptions about environmental relationships (Moxey et al. 1998). However, both ecological and economic research is essential for successful design, planning, implementation and evaluation of AEM. Integrated economic-ecological analyses, therefore, try to resolve these issues by combining the best of both worlds.

The following general conclusions can be drawn from the available studies:

- Ecological effects of AEM are heterogeneous depending on landscape and scheme factors and investigated indicators. Contrasting experiences often result from different study designs (comparing apples and pears). Despite the general impression of low effectiveness of AEM, it is difficult to judge whether AEM are truly often disappointing or whether methodological problems and the generally very critical scientific discourse lead predominantly to the publishing of "failure" cases.
- While earlier studies emphasized that action-oriented schemes based on management prescriptions are only one option from a wide pool of alternatives, more recent studies show that alternative approaches such as auctioning face problems in reality. The number of practically relevant approaches that meet the test of preferably low private and public transaction costs while also not causing excessive deadweight costs appears to be much smaller than theoretically expected. The implementation of, for example, payments by results, or the outsourcing of conservation activities to non-governmental institutions seems to be limited to a number of well-defined environmental problems with comparatively clear causal relationships between action and impact (characteristics, local) while the majority of conservation problems addressed by AEM will still remain a task for the state. Instead of a general replacement of management agreements, it is therefore more likely that with complex and imperfectly understood ecological and cultural systems, multiple and interrelated outputs, and high transaction costs, a variety of mechanisms is required in order to generate the composition and levels of environmental services demand (cf. Hodge 2000, p. 270).

- The institutional environment of AEM is restrictive and not transparent enough, which limits possible innovations and changes. The influence of lobby groups is unbroken and hinders the implementation of new approaches. Participation of stakeholders in the decision-making process on AEM is recommended but costly and meets with resistance from government agencies and probably also from farmers, if those feel that their concerns are not considered well enough; continued experiences might help overcome this problem in that both agencies and farmers get used to more participation.
- Better spatial targeting (benefit-targeting) is recommended to increase the effectiveness of schemes; to increase their efficiency (the least-cost way in achieving objectives) would require a benefit-cost-targeting strategy, but this option is constrained by the fact that the spatial distribution of costs is unknown. A model-based possibility to estimate the distribution of on-farm compliance costs based on available accountancy data and survey-based farm management data, taking the example of a grassland extensification measure, has been provided in Uthes et al. (2010c).
- Agri-environmental programming requires that several measures are considered simultaneously. The relative suitability of measures in terms of costs and effects, the available budget and the priorities of decision-makers need to be considered to determine the optimal allocation of financial resources. Here mathematical programming can be used to assist optimal budget planning and priority setting (for an example, see the methodology in Uthes *et al.* 2010a).

The present pool of publications is dominated by primarily empirical studies of the environmental effects of AEM as well as theoretical studies related to optimal contract design. The planning situation of the government authorities responsible for the planning and monitoring of AEM, however, plays only a marginal role in most case studies. In practice, the situation of the authorities and agencies are the decisive factor and therefore deserve greater attention by empirical studies, as otherwise their practical implications are difficult to assess. Finally, existing research fails to provide a holistic picture from both perspectives and at a scale that is helpful at the scale of decision-making. Agri-environmental programming is a complex planning and management problem. Multiple measures contribute to multiple objectives combined with an often fragmented data landscape (data are gathered by independent authorities); and insufficient empirical evidence regarding their ecological effects make responsible authorities struggle with the planning and evaluation of agri-environmental programs. Objectives are often imprecise and how different measures can be managed (design, planning, implementation, evaluation) coherently is not addressed in most existing

studies. Studies that deal with multiple schemes and thus with multiple environmental objectives and targets simultaneously as well as cross-regional analyses are underrepresented in the existing pool of literature. Information on their relative effectiveness in relation to their costs (including direct compensation costs, information costs, and monitoring costs) in the different EU member states are needed to improve the decision grounds of both regional and EU decision-makers. Only the contributions of Kirschke and Jechlitschka (Kirschke & Jechlitschka 2003, Kirschke *et al.* 2004, Kirschke *et al.* 2007, Ziolkowska 2009) deal with the problem of optimal budget planning and priority setting in agri-environmental programming, this however without a spatial component.

5.2.5 Current legal basis

Council Regulation (EC) No 1698/2005 of 20 September 2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD)
Source: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32005R1698:EN:NOT

Article 39
Agri-environment payments
1. Member States shall make available support provided for in Article 36(a)(iv) throughout their territories, in accordance with their specific needs.
2. Agri-environment payments shall be granted to farmers who make on a voluntary basis agri-environmental commitments. Where duly justified to achieve environmental objectives, agri-environment payments may be granted to other land managers.
3. Agri-environment payments cover only those commitments going beyond the relevant mandatory standards established pursuant to Articles 4 and 5 of and Annexes III and IV to Regulation (EC) No 1782/2003 as well as minimum requirements for fertiliser and plant protection product use and other relevant mandatory requirements established by national legislation and identified in the programme. These commitments shall be undertaken as a general rule for a period between five and seven years. Where necessary and justified, a longer period shall be determined according to the procedure referred to in Article 90(2) for particular types of commitments.
4. The payments shall be granted annually and shall cover additional costs and income foregone resulting from the commitment made. Where necessary, they may cover also transaction cost. Where appropriate, the beneficiaries may be selected on the basis of calls for tender, applying criteria of economic and environmental efficiency.
Support shall be limited to the maximum amount laid down in the Annex.

Annex
Amounts and rates of support

39(4)	Annual crops	600 (****)	Per hectare
	Specialised perennial crops	900 (****)	Per hectare
	Other land uses	450 (****)	Per hectare
	Local breeds in danger of being lost to farming	200 (****)	Per livestock unit

5.2.6 Guide for the analysis in SPARD

Table 13: Catalogue of questions guiding the spatial econometric analysis (214)

Questions guiding the analysis	***Answer***
What is the spatial distribution of the measure in the EU (hot spots)?	Most important measure. 23.6% of total public budget allocated (35 billion including EU and national contribution). The measure is offered in all 27 EU member states. Relative share in total public RD budget ranges from 46.3% (Ireland) to less than 6.8% in Latvia. Highest acceptance in extensive regions (mountainous areas, grassland areas) Low implementation in prime agricultural regions
Is the measure likely to have spillover effects?	Non-local environmental phenomena, yes Assumption: spillovers related to geophysical connectivity (mountains, medium and low soil fertility)
Is the chosen spatial scale (NUTS2, RDP region) appropriate (area-root-problem)?	The programming region is generally appropriate for the analysis. Assumption: differences between regions can be partially the result of actions taken in other regions.
What factors influence the performance of the measure (explanatory variables)?	• Co-financing share of the measures (specifically targeted, effective measures are often excluded from the EU co-financing policy, poor regions will therefore be dominated by less effective horizontal measures) • Share of extensive agricultural area, share of intensive agricultural area (measures generally more effective (maintenance effects) and accepted in already extensive areas) • Site factors • Temporal factors • Type of operation, ratio of horizontal vs. targeted measures • Acceptance (measures with only a few participants will only have local effects) • Targeting rate (ratio of measures performed in vulnerable areas) • Ratio full-time/ part-time farming (full-time positive for implementation)
Possible impacts (dependent variables)	- +Factor payment labor (modulation study) - ++Factor payment land, rental prices (modulation study) - +Land available for agriculture (modulation study) - +Farm income (extensive farms) - + or - biodiversity - +Water - +Cultivated landscape - +/-Erosion - +Employment (maintenance of jobs, e.g. if extensive livestock farms are supported), Cash flow III criterion - -Structural change (number of farms falls less than in other comparable regions, farm size less increasing) - demographic change (reduced migration of young people) - other more suitable variables, such as population of farmland birds have a poor data availability in various countries, particularly in the new member states, where no bird monitoring systems exist for reasons of cost.

Unintended effects	Displacement effects (increased competitiveness of supported farms can have adverse effects on non-supported farms) Slippage effects (non-participants intensify farming) Deadweight effects (practice would also be present without the payments)
Measurement problems	
Time lag between action taken and impact	nearly all environmental impacts: biodiversity, soil, water quality (nitrate leaching, in deep layer soils)
Counterfactual (control groups)	
Scale of application (full farm vs. part of plot)	Measure contains very different types of operation, e.g. organic farming vs. extensive management of field margins, all measured in area under implementation

5.2.6.1 Corresponding CMEF indicators (measure 214)

Indicator	Measurement/unit	Scale	Years	Data
Baseline indicators (objective-related)				
Biodiversity: Population of farmland birds	Trends of index of population of farmland birds, Index (2000 = 100)	N2		n.a.
Biodiversity: High Nature Value farmland and forestry	UAA of High Nature Value farmland (Ha of UAA)	N2		n.a.
Water quality: Gross Nutrient Balances	Surplus of nutrient per ha (kg/ha)	N2		n.a.
Water quality: Pollution by nitrates and pesticides	Annual trends in the concentrations, Index (1992-1994 = 100), Trends in concentration of total oxidised nitrogen (converted in NO3 mg/L), Trends in concentration of pesticides (µg/L)	N2		n.a.
Soil: Areas at risk of soil erosion	Areas at risk of soil erosion (tons/ha/year, estimate)	N2		n.a.
Soil: Organic farming	Utilised Agricultural Area under organic farming (Ha)	N2	2007	Ha: 184 (%: 182)
Climate change: Production of renewable energy from agriculture	Renewable energy from agriculture: KToe (1000 tons of oil equivalent)/Renewable energy from forestry: KToe (1000 tons of oil equivalent)/forestry	N2		n.a.
Climate change/air quality: gas emissions from agriculture	Emissions of greenhouse gases and of ammonia from agriculture (1000 t of CO2 equivalent for greenhouse gases, 1000 t of ammonia)	N2		n.a.
Baseline indicators (context-related				
Designation of rural areas	Designation of rural areas according to the OECD methodology	N2	2001	271
Importance of rural areas	This indicator consists in 4 sub-indicators (% territory in rural areas, % population in rural areas, % Gross Value Added in rural areas, % employment in rural areas)	N2	2006	138-195
Agricultural land use	% Utilised Agricultural Area in arable area / permanent grass /	N2	2007	271

	permanent crops			
Land cover	% area in agricultural / forest / natural / artificial classes	N2	2000	265
Less Favoured Areas	% UAA in non LFA / LFA mountain / other LFA / LFA with specific handicaps	N2	2000	236-257
Areas of extensive agriculture	% Utilised Agricultural Area for extensive arable crops, % Utilised Agricultural Area for extensive grazing	N2	2007 for the area, average 2005-2005 for the yield	258-268
Natura 2000 area	% of territory under Natura 2000, % UAA under Natura 2000, % forest area under Natura 2000	N2		n.a.
Biodiversity: Protected forest	% FOWL protected to conserve biodiversity, landscapes and specific natural elements (MCPFE 4.9, classes 1.1, 1.2, 1.3 & 2)	N2		n.a.
Development of forest area	Average annual increase of forest and other wooded land areas (Ha/year)	N2		n.a.
Forest ecosystem health	% trees / conifers / broadleaved in defoliation classes 2-4	N2		n.a.
Water quality	% territory designated as Nitrate Vulnerable Zone	N2		n.a.
Water use	% irrigated UAA	N2	2007	229
Protective forests concerning primarily soil, water and other ecosystem functions	FOWL area managed primarily for soil & water protection (MCPFE 5.1 class 3.1) (%)	N2		n.a.
Input indicators				
Expenditure (planned)	Amount of public expenditure realised (total versus EAFRD)	M(C)	2007-2013	1
Output indicators				
Number of farm holdings and holdings of other land managers receiving support (division according to the beneficiary and the age of the commitment)	n	M(RDP)	2007-2013	87 (targets)
Total area under agri-environmental support (division according to the beneficiaries, the age and type of the commitment)	Number of ha	M(RDP)	2007-2013	88 (targets)
Total number of contracts (division according to the beneficiaries, the age and type of the commitment)	n	M(RDP)	2007-2013	86 (targets)
Physical area under agri-environmental support (under this measure)	Number of ha	M(RDP)	2007-2013	81 (targets)
Number of actions related to genetic resources (division according to the type of	n	M(RDP)		n.a.

action –targeted or concerted actions)				
Result indicators				
Areas under successful land management contributing to improvement of biodiversity	Number of ha	**RDP(!)**	2007-2013	80 (targets)
Areas under successful land management contributing to improvement of water quality	Number of ha	**RDP**	2007-2013	78 (targets)
Areas under successful land management contributing to mitigating climate change	Number of ha	**RDP**	2007-2013	72 (targets)
Areas under successful land management contributing to improvement of soil quality	Number of ha	**RDP**	2007-2013	76 (targets)
Areas under successful land management contributing to avoidance of marginalization and land abandonment	Number of ha	**RDP**	2007-2013	76 (targets)
Impact indicators				
Reversal in biodiversity decline	Change in trend in biodiversity decline as measured by farmland bird species population, % change complemented by qualitative judgement	RDP	2007-2013	36 (targets)
Maintenance of high nature value farmland and forestry	Changes in high nature value areas (Quantitative change and qualitative judgement)	RDP	2007-2013	35 (targets)
Improvement in water quality	Changes in gross nutrient balance (GNB) (Value and trend)	RDP	2007-2013	23 (targets)
Contribution to combating climate change	Increase in production of renewable energy	RDP	2007-2013	29 (targets)

N2= NUTS2 (n=271), M=measure, RDP=rural development plan (program, n=88), c= country, n.a. not available (09/2010)

5.3 Diversification into non-agricultural activities (311)

5.3.1 History

From axis 3, we decided to begin our analysis with measure 311 “diversification into non-agricultural activities”. The origin of the measures in axis 3 is further removed from the agricultural sector than the measures in axis 1 and 2 and as a result they can be described as the only true rural (rather than agricultural) development measures of the RD catalogue (Agra CEAS 2005). The content and the grants are similar to measure 121 with the difference that 311 focuses on non-agricultural investments, while 121 has a pure agricultural focus. Both measures were handled together in the programming period 2000-2006 and a separation of the evaluation results only for non-agricultural investments is factually not possible.

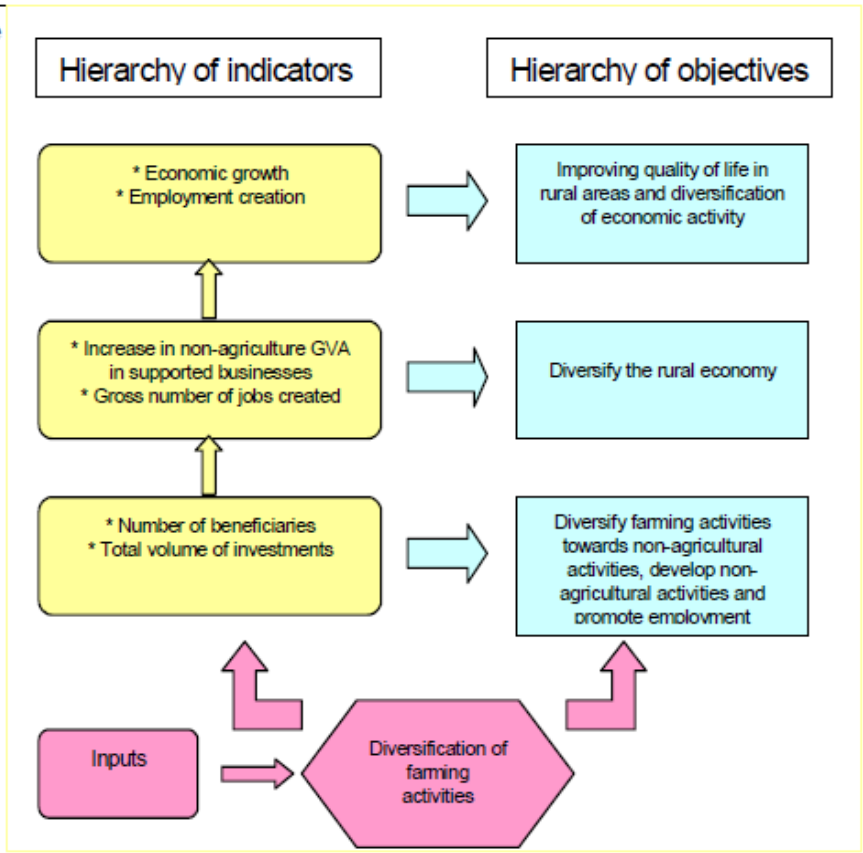


Figure 14: Intervention logic of the measure 311[20]

[20] http://ec.europa.eu/agriculture/rurdev/eval/guidance/note_e_en.pdf

5.3.2 Fiche provided in the review of RD instruments

Source: (Dwyer *et al.* 2008b)

Fourth ID report, task 5.4 Annex 2 – instrument fiches

Axis 3

	Part A: Description	
A.1	Title of instrument:	**Diversification into non-agricultural activities**
A.2	Existing instrument or new instrument:	Existing instrument (311)
A.3	Policy intervention type:	Rural quality of life - Physical capital, but also competitiveness – physical and financial capital
A.4	Objective of instrument:	To promote growth, employment and sustainable development in rural areas and thereby contribute to a better economic and social balance. To diversify, maintain and increase farm household incomes.
A.5	Indirect effects	Stabilisation and diversification of household income; adding value to agricultural products; reducing vulnerability of farm households to changes in specific markets and to price fluctuations
A.6	Targeting, eg defined:	Targeted at members of the farm household. Activities have to be non-agricultural. In many countries diversification support is not really targeted and funds are awarded on a first come, first served basis. Support is mainly in the form of 'tangible or intangible' investments including service activities (bed and breakfast, education and social activities on farm, craft activities), processing and marketing activities (creation of stores).
	Sectorally	
	Geographically	
	In respect of human criteria	
A.7	Method of delivery:	Investment aid – grants approved in advance, paid once work is completed, direct to final beneficiary
A.8	Extent of past experience with instrument in the EU:	The instrument was in Regulation 1257/99 as part of Article 33, and in Structural fund programmes in 1994-9. It was the most widely implemented measure in Axis 3 during the 2000-06 funding period with around €644m of EU funds spent in 25 MS. Planned use 2007-13 is 8.6% of total axis 3, was 12.2% in 2000-06.
A.9	Corresponding CMEF result and impact indicators:	R = Increase in non-agricultural GVA in supported businesses, gross number of jobs created I = economic growth, employment creation
A.10	Single cell, multiple cell or joint cell in table 5.2 (assess and note)	Instrument is an investment aid and serving the purpose of providing private physical capital for competitiveness, adding value, developing new products.
A.11	Linkages to other RD measures:	Instrument is linked with the setting-up of young farmers, modernisation of agricultural holdings, business creation and development, and encouragement of tourism activities
A.12	Linkages with other EU (non-CAP) funding sources:	The instrument shares similarities in objectives with instruments implemented under the ERDF, however ERDF supported investments tend to be larger and they are generally targeted at non-agricultural businesses. Linkages with ESF qualification measures are also important (acquisition of new skills for new business activities and services)
	Part B: Relation to EU policy objectives	
B.1	Corresponding guidelines(s) or key	Improving quality of life and encouraging

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	action(s) from the EU Strategic Guidelines for Rural Development	diversification of the rural economy
B.2	Potential to respond to other EU priorities (specify)	Instrument contributes to overarching Lisbon strategy of the creation of employment opportunities (dynamic and competitive economy) and, potentially, to a valorisation of local natural and cultural resources
	Part C: Resources Needed	
C.1	Resources for delivery.	Direct measure costs medium; administration costs medium – requires supporting advice, business planning and careful follow-through. Project selection can be a costly process.
	Part D: Effectiveness	
D.1	Effectiveness of instrument:	Moderate to high, private investment ensures engagement of the investor, but there is evidence of poor uptake due to transaction cost barriers and lack of capacity among farmers, as well as some deadweight in that successful beneficiaries may well have been able to diversify without aid, in some cases. Often more attractive if targeted at farm family members (especially spouses and younger generation), than at principal farmers themselves.
D.2	Potential causes of policy failure:	Insufficient checking of business plans; rapid changes in market situations which disadvantage the planned diversification, and poor market research / incorrect assumptions on which calculations are based. Poor uptake in areas or situations where diversification could be highly beneficial but farmers/family members lack the confidence and skills to develop these options.
	Part E: Recommendation	
E.1	Overall assessment:	The instrument is generally assessed as positive, however it can increase competition in limited markets and lead to significant displacement effects (most obvious in cases like farm tourism, where farm-based new enterprise can displace established non-farm tourist businesses in rural areas). Will perform best when delivered alongside sound business training and skills development and supported by high-quality advice and mentoring / peer group support.
E.2	Recommendation:	The measure should be kept, however minimum conditions and criteria for better targeting need to be demanded from member states and regions in EU regulation, to ensure that appropriate situations and needs/opportunities have been identified and to avoid displacement. Encourage its use in integrated strategic packages alongside training/capacity-building in entrepreneurship and innovation, as well as adding value and marketing, and targeting whole farm families.

5.3.3 Current legal basis

Council Regulation (EC) No 1698/2005 of 20 September 2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD)
Source: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32005R1698:EN:NOT

SECTION 3
Axis 3
The quality of life in rural areas and diversification of the rural economy
Article 52
Measures
Support under this section shall involve:
(a) measures to diversify the rural economy, comprising:
(i) diversification into non-agricultural activities,
….

Conditions governing the measure to diversify the rural economy
Article 53
Diversification into non-agricultural activities
The aid beneficiary referred to in Article 52(a)(i) shall be a member of the farm household.

5.3.4 Guide for the analysis in SPARD

Table 14: Catalogue of questions guiding the spatial econometric analysis (214)

Questions guiding the analysis	***Answer***
What is the spatial distribution of the measure in the EU (hot spots)?	Rank 16. 1.6% of total public budget allocated (2.4 billion including EU and national contribution). The measure is offered in 20 EU member states. Relative share in total public RD budget ranges from 7.4% (Slovakia) to 0.2% in Luxembourg.
Is the measure likely to have spillover effects?	There are spill-over effects of this measure code. For example, a popular tourist destination would have some positive externalities on the neighboring regions.
Is the chosen spatial scale (NUTS2, RDP region) appropriate (area-root-problem)?	
What factors influence the performance of the measure (explanatory variables)?	• Intensity of aid per beneficiary • Total investment volume (can set incentives to over-investment) on average • Type of investment • Framework conditions (market prices, rental prices[21], interest rates) • Ratio of public vs private expenditure • Ratio of private costs borne by the beneficiary/total eligible costs • Investment distribution (ratio of small vs. large investments) • Main agricultural product of the region would be an explanatory variable here. For example, wine tourism is highly popular in grapes producing countries • Farm size could be important variable for the diversification – large farms would have better position to go for diversification because of economies of scale • Characteristic of the location could be important for diversification motivation of farmers. So a dummy for location aspect could be added to this list of explanatory variables. • Investment volume in Axis 1 would have negative impact on this measure
Possible impacts (dependent variables)?	+Factor payment capital (modulation study) ++Human capital (modulation study) +Fixed assets (modulation study) +/-Employment (maintenance, possible increase in non-agricultural sector) +Labor productivity in non-agricultural sector

[21] High rental prices for land may lead to increased land acquisition, thus reducing liquidity for other investments, resulting in a low uptake of investment schemes (Eastern Germany (Bergschmidt *et al.* 2008b), Lithuania (Agra CEAS 2005)).

5.3.4.1 Corresponding CMEF indicators (measure 311)

Indicators	Measurement/unit	Scale	Years	Data*
Baseline indicators (objective-related)				
Farmers with other gainful activity	Sole holders-managers with other gainful activity as percentage of total number of farm holders (sole holders-managers) (%)	N2	2007	269
Employment development of non-agricultural sector	Employment in secondary and tertiary sectors (thousands of people employed)	N2	2006 (change 2000-2006)	271
Economic development of non-agricultural sector	GVA in secondary and tertiary sectors (Mio. Euro)	N2	2006	271
Baseline indicators (context-related)				
Designation of rural areas	Designation of rural areas according to the OECD methodology	N2	2001	271
Importance of rural areas	This indicator consists in 4 sub-indicators (% territory in rural areas, % population in rural areas, % Gross Value Added in rural areas, % employment in rural areas)	N2	2006	138-195
Agricultural land use	% Utilised Agricultural Area in arable area / permanent grass / permanent crops	N2	2007	271
Population density	Inhabitants / km2	N2	2006	271
Age structure	% people aged (0-14) y.o. / (15-64) y.o. / >=65 y.o. in total population	N2	2007 (change 2000-2007)	266
Structure of the Economy	% GVA by branch (Primary / Secondary / Tertiary sector)	N2	2006 (change 2000-2006)	271
Structure of employment	% employment by branch (Primary / Secondary / Tertiary sector)	N2	2006 (change 2000-2006)	269
Long-term unemployment	% long-term unemployment (as a share of active population)	N2	2008 (change 2003-2008)	271
Educational attainment	% adults (25_64) with Medium & High educational attainment (number, %)	N2	2008 (change 2005-2008)	267
Internet infrastructure	DSL coverage (%)	N2	n.a.	n.a.
Input indicators				
Expenditure (planned)	Amount of public expenditure realised (total versus EAFRD)	M(C)	2007-2013	1
Output indicators				
Number of beneficiaries (division according to gender, age category and the type of non-agricultural activity)	n	M(RDP)	2007-2013	77 (targets)
Total volume of investment (division according to gender, age or type of non-agricultural activity)	Euro	M(RDP)	2007-2013	76 (targets)
Result indicators				
Increase in non-agricultural	Euro	M(RDP)	2007-	63

gross value added in supported businesses			2013	(targets)
Gross number of jobs created	Number of jobs created	M(RDP)	2007-2013	75 (targets)
Impact indicators				
Economic growth	Net additional value added expressed in PPS (Purchasing Power Standard)	RDP	2007-2013	46 (targets)
Employment creation	Net additional Full Time Equivalent jobs created (Full Time Equivalent jobs)	RDP	2007-2013	70 (targets)

*Number of regions for which data exist

N2= NUTS2 (n=271), M=measure, RDP=rural development plan (program, n=88), c= country, n.a. not available (09/2010)

6 Conclusions

This report was originally planned to be delivered at a relatively early date of the SPARD project duration (month 6), with the intention to provide a guide throughout the project life time. When SPARD started a number of challenges became apparent which could not been foreseen when the project was planned. Challenges included limitations in the data availability and quality of the CMEF (including primarily data gaps, particularly at the NUTS3 level, but also the existence of outliers for various indicators, or different reporting periods) as well as technical obstacles, such as the provision of data in a database incompatible format. Also the general suitability of the indicators gathered in the CMEF was questioned from various sources and adaptations of the framework were indicated. It was therefore decided to design D3.1 as a "living document" with continuous updates according to new developments with regard to the obstacles mentioned above. However, when the project further continued, it became apparent that the mentioned obstacles would persist until the end of the project, and likely beyond. D3.1 has therefore been finalized in November 2011 (month 18) based on our knowledge at this point. The report in its final version shows that the currently available data material on RDP measures in terms of literature and CMEF data does not allow for a comprehensive analysis of all single 27 RDP measures or the entire RDP over time series. In accordance with the demands by the end-users, the overall activity pathways in SPARD have therefore been specified as follows. I. WP2 and WP6 will develop of a data organization and retrieval tool, based on the newly developed SPARD Data Viewer and the already existing MetaBase software[22] (with new extensions). II. WP4 and WP5 will explore of a set of spatial econometric models, including the two steps of exploratory data analysis (ESDA, see D4.2, available on the SPARD website) and spatial econometric modeling (see D4.3 and 4.4, due in month 20 and 24, respectively) applied at the EU-27 and at the level of the SPARD case studies, and will concentrate on measures with either high uptake or high relevance towards rural development objectives. The results of both pathways will be communicated to the end-users from the European Commission but will probably not part of one tool ready for use to evaluate the programming period 2007-2013. However, they will (i) provide an impression of the suitability of spatial econometric modeling for the analysis of RDP measures; (ii) allow for recommendations for the further development of the CMEF and related data sources; and thus (iii) provide the foundation for an extended evaluation tool for use in following planning periods.

[22] A product of LEI (for an overview, see https://www3.lei.wur.nl/metabase/)

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Appendix

Table 15: Mapping table between NUTS 2 regions and RDP regions (Source: Bernd Schuh)

ID_geo	lfnr	Region
AT-Rest	*1*	*Österreich ohne Wien*
BE2	*2*	Vlaams Gewest
BE3	*3*	Région Wallonne
BG-Rest	*4*	*BG ohne Yugozapaden*
CY	*5*	**Zypern**
CZ-Rest	*6*	*CZ ohne Region Prag*
DK	*7*	**Dänemark**
EE	*8*	**Estland**
Man-Rest	*9*	*Manner-Suomi ohne Etelä*
FI2	*10*	Åland
Hex-Rest	*11*	*Hexagone ohne Île de France*
FR94	*12*	Réunion (FR)
FR92	*13*	Martinique (FR)
FR91	*14*	Guadeloupe (FR)
FR93	*15*	Guyana (FR)
FR83	*16*	Corse
DE2	*17*	Bayern
DEB	*18*	Rheinland-Pfalz
DE1	*19*	Baden-Württemberg
DE7	*20*	Hessen
DEA	*21*	Nordrhein-Westfalen
DE9+DE5	*22*	Niedersachsen + Bremen
DEC	*23*	Saarland
DE6	*24*	Hamburg
DEF	*25*	Schleswig-Holstein
DEE	*26*	Sachsen-Anhalt
DED	*27*	Sachsen
DEG	*28*	Thüringen
DE8	*29*	Mecklenburg-Vorpommern
DE4+DE3	*30*	Brandenburg + Berlin
DE	*31*	Deutschland gesamt
GR-Rest	*32*	*GR ohne Attiki*
HU-Rest	*33*	*HU ohne Közép-Magyarország*
ITC1	*34*	Piemonte
ITF1	*35*	Abruzzo
ITE2	*36*	Umbria
ITE3	*37*	Marche
ITD5	*38*	Emilia-Romagna
ITE1	*39*	Toscana
ITD4	*40*	Friuli-Venezia Giulia
ITD3	*41*	Veneto

ITD2	*42*	Provincia Autonoma Trento
ITC3	*43*	Liguria
ITC4	*44*	Lombardia
ITC2	*45*	Valle d'Aosta/Vallée d'Aoste
ITD1	*46*	Provincia Autonoma Bolzano-Bozen
ITF3	*47*	Campania
ITF4	*48*	Puglia
ITF5	*49*	Basilicata
ITF6	*50*	Calabria
ITG1	*51*	Sicilia
ITG2	*52*	Sardegna
ITF2	*53*	Molise
ITE4	*54*	Lazio
IE	*55*	**Irland**
LV	*56*	**Lettland**
LT	*57*	**Litauen**
LU	*58*	**Luxemburg (Grand-Duché)**
MT	*59*	**Malta**
NL-Rest	*60*	*Niederlande ohne Noord-Holland*
PL-Rest	*61*	*PL ohne Mazowieckie*
Cont-Rest	*62*	*Continente ohne Lisboa*
PT30	*63*	Região Autónoma da Madeira (PT)
PT20	*64*	Região Autónoma dos Açores (PT)
RO-Rest	*65*	*RO ohne Bukarest*
SK-Rest	*66*	*SK ohne Bratislava*
SI	*67*	**Slowenien**
ES24	*68*	Aragón
ES53	*69*	Illes Balears
ES51	*70*	Cataluña
ES23	*71*	La Rioja
ES30	*72*	Comunidad de Madrid
ES22	*73*	Comunidad Foral de Navarra
ES21	*74*	Pais Vasco
ES13	*75*	Cantabria
ES61	*76*	Andalucia
ES12	*77*	Principado de Asturias
ES70	*78*	Canarias (ES)
ES42	*79*	Castilla-la Mancha
ES41	*80*	Castilla y León
ES52	*81*	Comunidad Valenciana
ES43	*82*	Extremadura
ES11	*83*	Galicia
ES62	*84*	Región de Murcia
ES	*85*	Spanien gesamt
SE-Rest	*86*	*SE ohne Stockholm*

Eng-Rest	*87*	*England ohne London*
UKN	*88*	Northern Ireland
UKM	*89*	Scotland
UKL	*90*	Wales

Comment: Capital regions in some countries are excluded but not in others. For instance, Berlin is included, Vienna not. Copenhagen, Rome and Madrid are included, Paris, Brussels and Noord-Holland are not (Noord-Holland is part-urban and part-rural). The classification rural/peri-urban/urban is less relevant here – it is important whether the regions have an RDP or are part of one, for example Berlin and Hamburg have their own rural development plans and are therefore included.