European Evaluation Network for Rural Development

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Agriculture and Rural Development

WORKING PAPER ON

Approaches for assessing the impacts of the Rural Development Programmes in the context of multiple intervening factors

USER INFORMATION BROCHURE

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Findings of a Thematic Working Group established and coordinated by
The European Evaluation Network for Rural Development

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European Evaluation Network for Rural Development

The European Evaluation Network for Rural Development (abbreviated to “Evaluation Expert Network”) operates under the responsibility of the European Commission’s Directorate-General for Agriculture and Rural Development. The overall aim of the Network is to increase the usefulness of evaluation as a tool for improving the formulation and implementation of rural development policies by helping to establish good practice and capacity building in the evaluation of rural development programmes up until 2013.
Additional information about the activities of the Evaluation Expert Network and its Evaluation Helpdesk is available on the Internet through the Europa server (http://ec.europa.eu/agriculture/rurdev/eval/network/index_en.htm)

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Purpose and contents of the Working Paper

The evolution of evaluation practices for the EU co-funded Rural Development Programmes (RDPs) has taken an important step forward for the current programming period (2007-2013). Building on past experience, a strategic approach to planning, programming, monitoring and also evaluation has been introduced. The requirements for evaluation have been reinforced, and a common framework for monitoring and evaluation (CMEF) has been developed, in view of guiding Member States towards a more effective system for assessing progress towards Community and national objectives. The CMEF is laid down in a set of documents drawn up by the Commission and agreed with the Member States.

In the context of the implementation of the CMEF, Member States have reported difficulties in identifying the impacts attributable to specific measures in view of multiple intervening factors. Therefore, a Thematic Working Group of the European Evaluation Network for Rural Development has been set up to provide methodological support on the assessment of the socio-economic and environmental impacts in this regard. A Working Paper has been the result of this work in which evaluation experts and practitioners were involved during 2009.

The Working Paper aims at operationalizing the CMEF with regard to the assessment of impacts. The document responds to the requirement – as listed in the Handbook on Common Monitoring and Evaluation Framework (Guidance note A): *The Methodology for the estimation of impact will be developed further during the programme period by the Evaluation Network* – meaning that this document describes possible methodologies to be applied for assessment of impacts in the CMEF context. Therefore, its purpose is to assist the responsible administrations in the Member States and the evaluators in assessing the impacts of RDPs by:

- providing methodological support for quantifying the seven common impact indicators laid down in the CMEF;
- exploring and proposing ways of overcoming the limitations of the common impact indicators;
- closing the gap between the establishment and quantification of indicators and the assessment of impacts at programme level.

The document allows for a pragmatic handling of measure-specific impacts, and includes – where applicable – relevant explanations for the establishment and analysis of the counterfactual situation (i.e. the situation of programme beneficiaries without the programme). Rather than determining a common EU method for addressing these issues, the Working Paper suggests a set of approaches, in order to allow Member States to capitalize on the work they have already undertaken on these topics. With this in mind, attention is given to collecting and utilizing examples of current practice across the EU.

The document has been produced in an interactive pdf document in order to provide utmost user friendliness and covers the following aspects:

- Explanation of the main requirements for assessment of impacts as laid down in the CMEF
- Main challenges in assessing impacts and overview of the three main phases of the evaluation architecture:
  - gauging the evidence of change,
  - identifying the drivers of change and
  - understanding change and concluding on future interventions
- Approaches and methods assessing the socio-economic impacts:
  - economic growth
  - employment creation
  - labour productivity
- Approaches and methods assessing environmental impacts:
  - reversing biodiversity decline
  - maintenance of high nature value farming and forestry areas
  - improvement in water quality
  - contribution to combating climate change
- Set of current practice examples from the Member States
- List of additional impact indicators as identified by the MS in the ex-ante evaluations of the RD programmes
- Comprehensive bibliographic sources, documents and websites for further use

How to use the Working Paper

The Working Paper on "*Approaches for assessing the impacts of the Rural Development Programmes in the context of multiple intervening factors*" is designed in an interactive pdf file to be downloaded at:

http://ec.europa.eu/agriculture/rurdev/eval/network/impacts_interactive_en.pdf.

The interactive pdf file provides the following features to ensure its user-friendliness:

- Full text of the working paper
- Coloured margins signal the specific parts of the document and guide the reader through general information and methodologies for the assessment of impacts
- Current practice examples are highlighted/in boxes
- Bookmarks are set at each of these sections, chapters and summary tables of all seven CMEF impact indicators
- Indices are linked with chapters, tables, figures and boxes in the document

The document is supposed to support the following different reader groups:

- Readers with administrational background (Managing Authorities, Steering Group Members, etc.)
- Evaluators and evaluation related readers
- Actors within RD Programme implementation and beneficiaries

A variety of current practices, which may be seen as inspiration and source for ongoing and future evaluation exercises, is included in the document as well as a set of additional (programme specific) impact indicators, which may serve as reference for own indicator development in the MS.

In the following, a summary of the findings for each of the seven common impact indicators is provided in table format. For each indicator, the following information is presented in a nutshell:

- Definition of the indicator
- The assessment of the indicator
- Identifying the drivers of change – aggregation matters (from micro to macro), arriving at net-effects (deadweight, multiplier effects etc.)
- Judgment and interpretation of the indicator
- Additional indicators (enlarging the focus of the assessment)

Summary tables on the CMEF impact indicators

Impact Indicator 1: Economic Growth

Aspect	Requirements	Indicator Specifics
Definition	The minimum requirement according to CMEF (Working Paper (WP) chapter 4.1.1) ▸ Baseline Indicator: – *"GVA per farm/enterprise"* or *"GVA for agriculture/food processing/forestry sector at basic prices in a given region"* ▸ Result indicator – *"GVA per farm/enterprise"* or *"GVA agriculture/food processing/forestry, etc. sector in a given region"* ▸ Impact indicator – *"Net GVA per farm/enterprise"* or "*Net GVA for agriculture/food processing/forestry etc. sector in a given region"* expressed in PPS standards (NAGVA-PPS)	The NAGVA-PPS indicator should measure impacts of a given RDP on value added generated in a group of direct programme beneficiaries as well as other farms/companies indirectly affected by this programme (WP 4.1.1.1). NAGVA-PPS indicator should include the following effects of a given RD programme: ▸ Direct programme effects occurring at the level of direct programme beneficiaries (direct effect of the RD programme on farm/company Gross Value Added (GVA) at a micro-level) ▸ Indirect programme effects (e.g. deadweight loss, leverage effects, etc.) occurring at the level of direct programme beneficiaries ▸ Indirect programme effects (general equilibrium effects) on other individuals/farms/companies (programme non-beneficiaries) affected by a given RD programme (e.g. substitution effects, displacement effects, multiplier effects)
Gauging evidence – the assessment	Recommendable methods of measurement: micro-macro approach ⇨ analytical steps (WP 4.1.3): *Practical approach in 2 stages:* Stage 1: Estimation of direct programme effects occurring at the level of direct programme beneficiaries (direct effect of the programme on GVA at a micro-level): (a) Select from the available data base (e.g. FADN data) all programme-eligible farms/enterprises (for a given measure) prior to the beginning of the RD programme (measure specific selection); (b) Divide above group into programme beneficiaries vs. non-programme beneficiaries; (c) Select from both groups comparable farms/enterprises (e.g. apply a matching method). (d) Check statistically the "similarity" of both groups prior to their participation in the programme (e.g. by performing balancing property tests on the most important farm characteristics); (e) Calculate specific policy indicators, e.g. Average Treatment Effects on Treated (ATT) to be estimated before the programme, using GVA per enterprise (T=0) as the result indicator; (f) Collect data on GVA per enterprise for both (matched) groups of farms/enterprises (beneficiaries vs. non-beneficiaries) after implementation of the programme (T=1); (g) Perform calculation of specific policy indicators, e.g. Average Treatment Effects on Treated (ATT) after the programme, using GVA per enterprise (T=1) as the result indicator; (h) Apply conditional DID method (combination of ATT and standard DID) to calculate the net effect of the RDP on GVA generated by programme beneficiaries (at micro-level); (i) Perform a sensitivity analysis of obtained results. Stage 2: Estimation of indirect effects of RDP at the level of direct programme beneficiaries taking into account and cross-relating impacts at micro and macro level, illustrated (in WP 3.3.4 & 3.3.5) for: ▸ Methodologies recommended for estimating deadweight, leverage, substitution, displacement and multiplier effects ….	In summary (WP 4.1.3): ▸ Calculation of the NAGVA-PPS indicator is a rather complex exercise, requiring abundant data, considerable methodological skills and effective programme monitoring systems in place. ▸ Generally, different methodologies can be applied. ▸ Although all of these methodologies have pros and cons the most promising are those based on sound counterfactuals and combining micro and macro approaches.

Aspect	Requirements	Indicator Specifics
	▸ …. and methods for calculating impacts at macro (regional or sectoral) level – *Note 1*: each approach implies advantages and drawbacks regarding cost restrictions. A well scrutinized choice has to be made for the methodology. – *Note 2*: For consolidating the outcomes, accompanying in-depth case studies should be conducted.	
	Data requirements, micro-macro approach (WP 4.1.4) The necessary "data ingredients" for calculating the NAGVA-PPS indicator using above methods (excluding multiplier effects) are: ▸ GVA and data on other important farm/enterprise characteristics calculated prior and after implementation of a given programme for programme beneficiaries (panel data); Source: FADN, national farm accountancy network, micro-statistics, surveys. ▸ Calculation similar to above for comparable programme non-beneficiaries (panel data); Source: FADN, national farm accountancy network, micro-statistics, surveys. ▸ GVA calculated prior and after implementation of a given programme for selected programme non-beneficiaries indirectly affected by the programme (panel data). Source: FADN, national farm accountancy network, micro-statistics, surveys. ▸ Gross value added calculated at sector level (Sections: A; A+B; C-E; F; G-I;). Source: EU National accounts: Agriculture, other sectors. ▸ Purchasing Power Parities as compiled by Eurostat on an annual basis (WP 3.3.4).	In summary (WP 4.1.4): ▸ Additional statistical data and surveys (micro-statistics and periodic or evaluation-related surveys) may be necessary, specifically to obtain relevant information for the non-farming sector (e.g. GVA, turnover, employment, etc. per enterprise), because outside the agricultural sector, the availability of individual data is rather scarce
Identifying drivers of change	Aggregation from micro-macro ▸ Quasi experimental methods (PSM in combination with DiD) – WP 3.3.3 ▸ Modelling approaches – any quantitative approach that allows to compute direct and indirect effects (WP 3.3.3.2 and 3.3.4.) ▸ Additional sources of information needed (a sufficient number of case studies) to be extrapolated onto the macro scale	Crucial issues in identification of key drivers of change in NAGVA-PPS are (WP 4.1.5): ▸ Careful separation of "true" programme effects from other factors (it requires a construction of an appropriate counterfactual base-line ⇨ the key issue in evaluation of programme impacts!) ▸ Careful selection of other sectors/enterprises/regions indirectly affected by a give RD programme (a pre-selection may be based on qualitative assessments of a situation) ▸ Application of advanced methodological approaches enabling calculation of specific programme general equilibrium effects
	Deadweight, net effects, multiplier effects: Generally, the estimation of indirect programme effects (at regional/programme level) can be done using 3 alternative methodological evaluation techniques (WP 3.3.4): (a) Statistical/econometric methods that control for the differences in: (a1) initial endowments and economic performance of programme beneficiaries (e.g. farms, food processing enterprises, specific rural communities, etc.) compared with equivalent non-beneficiaries; (a2) initial conditions, endowments and policies in programme areas compared with non-programme areas (or with other areas characterized by a different intensity of a programme in question);	▸ Calculation of NAGVA-PPS indirect effects is a rather complex exercise, requiring abundant data, considerable methodological skills and effective programme monitoring system in place. Generally, different methodologies can be applied. Although all of these methodologies have pros and cons the most promising are those based on sound counterfactuals and combining micro and macro approaches.

Aspect	Requirements	Indicator Specifics
	(b) Regional input-output (econometric) models; (c) Micro-macro models (including Computable General Equilibrium [CGE] framework)	
Understanding change & interpretation	Once appropriately computed, the NAGVA-PPS indicator can be interpreted as the net effect of RD programme impact on the economic growth (measured in net value added PPS) in a given region, thus enabling respective policy conclusions (WP 4.1.5)	▸ It is recommendable to complement above mentioned quantitative estimates of NAGVA-PPS with some qualitative information, e.g. by carrying out additional surveys focussing on displacement issues (labour, capital, etc.), or interviewing enterprises (programme non-beneficiaries) that feel to be affected by a given programme in order to find out a correct reference for a quantitative analysis. ▸ Additional qualitative surveys are especially important in case estimated effects of a given programme were found to be below certain expectations (e.g. NAGVA-PPS is negative, minimal, or far from target values). This additional qualitative analysis is particular necessary in order to answer question: "Why?"
Additional indicators – suggestions & MS examples	The "explanation gaps" between indicator measurement and assessment of impact will depend on a number of factors (WP 4.1.5). The most important are: ▸ Quality of available data ▸ Knowledge of a suitable methodology ▸ Extent and depth of analysis (e.g. pre-selection of sectors/farms/enterprises considered as indirectly affected by a given RD programme). Additional indicators have to be collected/computed to answer relevant horizontal and measure specific CEQ regarding the impact of a given RDP on: ▸ competitiveness of the agricultural sector, diversification and development of the rural economy, and/or the quality of life in rural areas,. For example, measurement of the impact of a given RDP on sectoral competitiveness requires using additional indicators: ▸ Share (%) of a given sector/group of farms in total output; ▸ Share (%) of a given sector/group of farms in total generated value added; ▸ Share (%) of a given sector/group of farms in sold production; ▸ Share (%) of a given sector/group of farms in exports The assessment of the impact of a given programme on the quality of life in rural areas or the measurement of a contribution of a given programme to development of the rural economy requires using other, synthetic indicators, e.g. Rural Development Index, Quality of Life Index, etc.	▸ Practical examples of calculation of direct and indirect effects of RD programmes at a micro farm level in Germany and Slovakia can be found in Michalek, 2009c. ▸ Examples of estimation of programme effects (direct and indirect) of a RD programme at a regional (NUTS-4) level in Poland and Slovakia, using RDI index and a generalized propensity score methodology are given in Michalek, 2009b. ▸ A detailed description of the methodological approach applied to construction of a synthetic measure of rural development and quality of life is provided in Michalek, 2009a.

Source: own table

Impact Indicator 2: Employment Creation

Aspect	Requirements	Indicator Specifics
Definition	The minimum requirement according to CMEF (Working Paper (WP) chapter 4.2.1) ▸ Baseline Indicators – *"Employment rate"* (B2), *"Unemployment rate"* (B3), *"Employment development of primary sector"* (B8), *"Employment development of Food Industry"* (B12), *"Employment development of Non-Agricultural Sectors"* (B28) ▸ Result indicator – *"Gross number of jobs created"* (R8) ▸ Impact indicator – *"Employment creation"* (I2)	*Baseline Indicator* (WP 4.2.1) The following additional Baseline Indicators are suggested: ▸ *"Employment development of primary sector (in Full Time Equivalents)",* ▸ *"Employment development of various Non-Agricultural Sectors, relevant in rural areas (in Full Time Equivalent)",* Note: Employment relevant Non-Agricultural Sectors vary by Member State. *Result Indicator* (WP 4.2.4) The Result Indicator (R8) should be extended to the primary sector as negative/positive employment effects of RD support are to be expected.
Gauging evidence – the assessment	Recommendable methods of measurement (WP 4.2.3) *General considerations* The quantification of employment impacts need to be approached from two sides: at micro level, gross employment effects are quantified accounting for deadweight, but not for displacement and multiplier effects. At macro level (NUTS 2 or 3), net employment effects and their contribution to the general employment trends are estimated. *Micro and macro level methods* Micro level methods include ▸ Propensity Score Matching (PSM), preferably in combination with difference-in-difference estimation ▸ Standard regression models, preferably panel models (to answer the question: how much?) ▸ Qualitative methods (case studies, questionnaires) (to answer the question: why?). Macro level methods include: ▸ standard regression models, preferably panel models ▸ various modelling approaches (CGE, linear programming) can be applied (WP 3.2.3).	▸ Experiences show that the numerous assumptions made in such complex models are hard to elicit and revise by evaluators. These regional models partly also fail to adequately reflect regional specificities (WP 4.2.3.4).
	Data requirements and collection (WP 4.2.4) *Micro level* ▸ Data on micro level should be collected from beneficiaries and non-beneficiaries on the basis of secondary data (e.g. FADN for measures 121, 211, 212, 214, 215) and/or own surveys. ▸ In general, PSM demands more data than standard regression models, DiD and panel models require more (longitudinal) data than cross-sectional approaches (see Chapter 3.2.4). *Macro level* ▸ Data for macro level analysis (NUTS 2 or 3) are to be collected from official statistics and should include data on employment and on factors that influence employment outcomes (e.g. wages, population, firm structure). ▸ Data on RD support should be gathered from the paying agencies at the micro level, broken down by type of supported activity, type of supported beneficiary, regional/postal zip/NUTS code of the supported project, public expenditures, etc.	Data availability determines the applicability of micro level evaluation methods (WP 4.2.4). ▸ PSM is very data demanding, because more observations are needed for non-beneficiaries than for beneficiaries; and matched sample sizes should be large enough to allow statistical testing. ▸ OLS is less demanding than PSM in data requirements. Suggested minimum sample sizes for PSM and OLS are mentioned. ▸ The collection of primary longitudinal data requires repeated surveys which double the costs of data collection.

Aspect	Requirements	Indicator Specifics
	▸ Support provided by other instruments (1st Pillar policies, Structural Funds, etc.) and those for the previous programming period should also be taken into account, especially when fitting macro level models.	
Identifying drivers of change	Aggregation from micro to macro (WP 4.2.5.2) An aggregation from micro to macro levels is not possible. Micro level analyses help to establish a causal link between supported activities and outcomes (e.g. number of jobs created by a specific type of activity). If there is no evidence of relevant impacts of RD support on micro level one should not expect impacts on macro level.	The creation of new jobs critically depends on macro economic side effects and how RD support is implemented on the micro level. ▸ Focusing on effects sheds no light on the conditions that facilitate or hamper the creation of jobs. ▸ This remains a black box if the evaluation methodology does not provide for additional methods (qualitative and/or quantitative) which need to be based on theory.
	Deadweight, net effects, multiplier effects (WP 4.2.3.1) ▸ Net effects = Gross effects – deadweight, displacement, substitution effects + multiplier effects. Micro level analysis allows the quantification of deadweight effects, providing that a counterfactual setting (PSM, standard regression models) is used. This requires to control for factors that are not influenced by RD policies but do affect employment outcomes. ▸ Displacement, substitution and multiplier effects occur in the nearer or wider surroundings of the supported beneficiary. Macro level analysis takes displacement, substitution and multiplier effects into account that occur in the same unit of analysis (e.g. in the same NUTS-region where the RD project is supported).	Alternatively, hypotheses regarding the level of deadweight, displacement, substitution and multiplier effects are sometimes used. ▸ But the magnitude of deadweight, displacement, substitution and multiplier effects strongly depend on present circumstances and how the RD policy is implemented. ▸ Thus, 'rule of thumb' figures available from literature may not be applicable for the assessment of RD support impacts in a specific region.
Understanding change & interpretation	The estimation methods described reside on a number of assumptions which have to be critically checked (WP 4.2.5). ▸ If all assumptions hold, the quantified employment impact allows the following statements: A positive net employment effect indicates whether the RD intervention helped to maintain jobs (against a general downward trend) or to create new jobs. ▸ The difference of gross employment effects (obtained from micro level analysis) and of net employment effects (obtained from macro level analysis) indicates the magnitude of displacement and multiplier effects. ▸ A proper quantification of employment impacts of RD support might be hampered by various factors including the time lags with which impacts occur, a missing critical mass of RD support, the non-monocausality of RD support and the total neglect of general welfare effects (opportunity costs of alternative spendings). – See WP 3.2.5	The welfare effects of RD policies need to be assessed from a macro-economic perspective. ▸ In general, factor productivity in agriculture lags behind those of other sectors. Under these circumstances, a shift of production factors from agricultural to non-agricultural sectors increases social welfare, and the creation/maintenance of jobs in agriculture through RD policies reduces social welfare. ▸ This means that employment creation in agriculture should be evaluated against a wider conceptual background including goals like food security, territorial resilience and demographic balance.
Additional indicators – suggestions & MS examples	If the employment impact indicator cannot be measured in full time equivalents it should at least be measured in absolute numbers of employed persons. (WP 4.2.4 & 4.2.5) ▸ Additional impact indicators suggested by some Member States are mentioned in Annex K of the CMEF, of which 'total factor productivity' and 'change of employment in non-agricultural sectors' seem to be the most relevant.	The result indicator intends to count the number of created jobs and not the number of created FTE. This problem could be tackled by including a result indicator “gross increase of jobs” calculated in FTE in the monitoring system, where full-time is defined with a certain amount of hours per week that varies between countries, half-time is 0.5, and part-time is normally assumed to be between 0.2 and 0.3 FTE (WP 4.2.4).

Source: own table

Impact Indicator 3: Labour Productivity

Aspect	Requirements	Indicator Specifics
Definition	The minimum requirements according to CMEF (Working Paper (WP) 4.3.1) ▸ Baseline Indicators – 6 Labour productivity in agriculture, 10 Labour productivity in food industry, 14 Labour productivity in forestry ▸ (Result indicator – 02 Increase in Gross Value Added in Supported Holdings/Enterprises, 07 Increase in Non-Agricultural Gross Value Added in Supported Businesses) ▸ Impact indicator – Change in Gross Value Added per Full Time Equivalent (GVA/FTE)	Labour productivity values for sectors cannot be compared; they should therefore not be aggregated to a total value including all sectors concerned (WP 4.3.3). ▸ Instead it is recommended to aggregate average values for GVA/FTE for each sector (agriculture, forestry, food) separately at programme level. ▸ Even within a sector a disaggregation of the data is necessary for very differing production systems
Gauging evidence – the assessment	Recommendable methods of measurement (WP 4.3.3) Labour productivity is measured and calculated at the level of individual holdings: GVA/FTE, where: ▸ GVA is: 'Value of output less the value of intermediate consumption' in Euro ▸ FTE is: 'Jobs, defined as total hours worked divided by average annual hours worked in full-time jobs (UN SNA 1993)'	In order to identify the tendency of development, time series comparison needs to be carried out, using constant prices (with zero level at the start of the programme) (WP 5.3.5.2). ▸ The indicator might be biased by drastic changes in price levels. Such fluctuations need to be smoothed out.
	Data requirements & collection (WP 4.3.4) Data sources are household-/holding-level primary data, EAFRD application data, FADN agricultural sector data, additional surveys. ▸ Issues: data quality, completeness; general data availability for forestry and food sector	Data availability is a general concern specifically for the food and forestry sectors; quality of data provided by beneficiaries (such as bookkeeping data) is often very low and needs reassessment. ▸ Linking administrative with FADN data to get consistent data base for evaluation has proven as a good method in some countries (WP 4.3.2.1)
Identifying drivers of change	Aggregation from micro-macro: A combination of methods should be used (WP 4.3.3): ▸ Statistical/process-based models ▸ Qualitative methods	▸ A calculation of net effects at micro level has many limitations as it can only include displacement and multiplication effects that are expressed in labour productivity limited to a specific sector and the observed region. ▸ No feasible methods are in place yet to establish the contribution of a programme to overall competitiveness of the relevant sectors.
	Deadweight, net effects, multiplier effects (WP 4.3.3, steps 4, 6) Deadweight effects may occur at direct beneficiary level, especially prominent for investment support measures (121, 122, 123) possibly also in food quality schemes. ▸ Options to identify and separate deadweight effects are for example questioning beneficiaries, profitability criteria, financial criteria or a comparison to non-beneficiaries (farmers, business owners) who make investment. ▸ Multiplier effects can be identified through observation of a sample group of indirect beneficiaries; good knowledge of impact pathways is important	▸ The cases of identified deadweight have to be recorded and excluded from the calculation of the average % change of GVA/FTE (WP 4.3.3, step 4). ▸ The task to estimate displacement and multiplier effects is most challenging and requires using a combination of methods. A calculation of net effects at micro level has many limitations as it can only include displacement and multiplication effects that are expressed in labour productivity limited to a specific sector and the observed region (WP 4.3.3 step 6).
	Capturing the counterfactual situation (WP 4.3.3, step 1): Establishing the counterfactual situation is done best by observation of a control group identified through a combined application of sound matching method (Propensity Score Method) and the Difference-in-Difference Method.	In many areas it is almost impossible to establish a true counterfactual for the agricultural sector, as most farmers have benefitted especially from investment measures with the past 10 years and beyond, and are therefore not considered non-beneficiaries.

Aspect	Requirements	Indicator Specifics
Understanding change & interpretation	GVA/FTE is an area-sensitive, partial productivity measure allowing for intra-sectoral comparison within a Member State. ▸ The labour productivity indicator expressed in GVA/FTE is best used to show the improvement of the competitiveness of holdings in the agriculture, forestry or food sector. ▸ Labour productivity can also be used to express the 'economic performance of agricultural holdings' at constant prices; assuming that the increase in GVA at constant FTE or the reduction of FTE at constant GVA leads to an increase in benefits for the holding, in other words that the maintenance of the ratio GVA/FTE also stands for a maintenance of economic performance. (WP 4.3.5.1)	Labour productivity is subject to cyclic fluctuations; this needs to be considered when interpreting the results.
Additional indicators – suggestions & MS examples	To be put into relation to other socio-economic indicators (economic growth, employment creation) (WP 4.3.5.2). Alternative measures of labour productivity are multi-/total factor productivity measure for performance comparisons of the agricultural industries between Member States using agricultural industry output at basic prices to a unit input bundle comprising capital, intermediate consumption and labour. Alternative indicators for comparison with other regions: ▸ Competitive Performance ▸ Revealed Comparative Advantage (RCA) ▸ Growth/Business Competitiveness Indicator (GCI/BCI) ▸ Domestic Resource Cost (DRC) using Policy Analysis Matrix (PAM))	Alternative possible definition for increased competitiveness can be significance of agriculture/forestry in regional/national value chains. However, there is no straightforward indicator available related to this definition (4.3.5.2). The indicator value cannot be interpreted with respect to the EU Treaty objective of "increasing agricultural productivity in order to ensure a fair standard of living for the agricultural community, in particular by increasing the individual earnings of persons engaged in agriculture". It does not provide information about the living standard of farmers. Alternatives approaches are: ▸ qualitative (interviews, focus group), ▸ quantitative (e.g. Remi model, SAM). Using mixed method approaches (qualitative and quantitative) to assess impacts against objectives are a good practice option.

Source: own table

Impact indicator 4: Reversing Biodiversity Decline

Aspect	Requirements	Indicator Specifics
Definition	<u>The minimum requirement according to CMEF (Working Paper (WP) chapter 5.1.1)</u> ▸ Baseline Indicator – *"Population of farmland birds"* ▸ Result indicator – *"area under successful land management contributing to biodiversity and high nature value farming/forestry"* ▸ Impact indicator – *"change in trend in biodiversity decline as measured by farmland bird species population"*	▸ The bundling of information stemming from baseline, result and impact indicators up to the programme level is essential ▸ This information has to be accompanied by qualitative information
Gauging evidence – the assessment	<u>Recommendable methods of measurement (WP 5.1.3)</u> ▸ In principle the impact indicator 'change in trend in biodiversity decline' as measured by farmland bird species population is measured in a bottom up way – linking the single measure of the RD programme with the effect on the farmland bird species population thus establishing a cause-effect relation. (For that purpose it is essential to find out as early as possible which data on bird impact indicators are available and which are the specific studies to be carried out.) ▸ In certain occasions capturing impacts at measure level can be done by using FBI data on a national scale, although they are not intended to measure the effectiveness of specific, fine-scale measures (e.g. agri-environment measure) implemented at site level. ▸ If the particular measure is being implemented at a very broad scale (e.g. reducing pesticide inputs across entire farms), and there are enough sample plots in areas where the measure is applied it might be possible to use also the results of common farmland bird monitoring to assess the effectiveness of the measure. ▸ Survey and analytical techniques will be highly variable between individual species/communities and may vary with other factors such as topography and time of year	FBI is a multi-species index obtained by the aggregation of a set of individual species indices using a geometric mean (WP 5.1.1). ▸ Individual indices are calculated for each species independently. By using the geometric mean, the species are weighted equally in the indicators. ▸ In case, the species indices are provided for a time period of a different length, the chain method is used in the indicator computation. The composition of the FBI may be changed according to local/regional specifics. ▸ As many countries faced with the short list of 19 'compulsory' farmland birds say that available data is insufficient to create a meaningful indicator, an official FBI based on a wider list of 36 species from across Europe has been developed. ▸ It makes sense for countries to adapt to some degree the species list to their farmland bird community to reflect the local situation and the 36 species allows them to do this appropriately. (The farmland bird species included are in WP 5.1.1.1)
	<u>Data requirements & collection (WP 5.1.4)</u> ▸ FBI data on plot and regional (NUTS 4 – 3) levels – sample plots in areas where the measure is applied. ▸ Note, in most cases the FBI does not have a good territorial coverage or the data do not coincide with areas under specific measures. If so, the use of other previous or ongoing bird monitoring should be investigated ⇨ ad hoc and highly replicated field studies, including pair-wise comparisons with control sites ▸ Where appropriate to the national/regional situation, can use an alternative composition of bird species. FBI calculates the aggregated Europe wide indicator on a basis of a "basket" of species tailored to best capture Europe wide trends, and its use at national or regional level requires "species baskets" tailored to the local conditions (i.e. including species that are good indicators for farmland habitats and are common enough to be captured in common birds surveys).	▸ Data availability on birds for baseline (Farmland Bird Index, FBI) and impact indicators as early as possible to be safeguarded (WP 5.1.4) ▸ The background of available data has to be documented properly (e.g. geographical coverage, sampling strategy, the number of replications, data collection methodology etc.) – to be able to link data not explicitly collected for RDP assessment of impacts to the RD measure cause-effect chain. ▸ The representativeness of available data should also be investigated (e.g. statistically by using specific analysis, expert opinion asked, etc.) ⇨ it is important to have a large and representative set of sample points and species
Identifying drivers of change	<u>Aggregation from micro-macro (WP 3.3)</u> ▸ Quasi experimental methods (PSM in combination with DiD) (WP 3.3.3) ▸ Modelling approaches – especially System dynamics modelling (WP 3.3.4.5) ▸ Additional sources of information needed (sufficient case studies) to extrapolate onto the macro scale	Counterfactual situation hardly applicable (WP 5.1.2): ▸ due to the complexity and site specificity of potential environmental impacts of RD programmes, the identification of control groups and the establishment of a situation with and without the programme in place are very difficult ▸ the lack of clear systemic borders of effects may lead to less reliable results in both the test and control groups

Aspect	Requirements	Indicator Specifics
	Deadweight, net effects, multiplier effects (WP 5.1.2) ▸ Deadweight and displacement effects may be difficult to quantify and may, at best, be addressed in a qualitative and contextual manner or with demanding multivariate approaches ▸ Capturing the counterfactual situation: GIS based bird data collection and spatial modelling approach for assessment of several/many explanatory factors simultaneously ▸ To separate the net effect of support from the gross effect, analyse exogenous factors effecting beneficiaries that are not dependent on the RDP implementation. Usually, multivariate statistics are needed to assess the net effects of RD measures.	For capturing the counterfactual situation: ▸ Multiple intervening factors which may affect the outcome have to be taken into account, this is complicated, especially in the case of 'broad and shallow' measures For separating the net effects of support from the gross effects: ▸ additional data (details of site location, crops, managements, habitats and landscape etc.) are needed
Understanding change & interpretation	▸ An assessment of the trends among breeding populations of characteristic birds can help to determine the quality of agricultural habitats and how this quality is changing through time (WP 5.1.5). ▸ The negative trends of breeding populations indicate an unfavourable and worsening status of the bird species, which is very likely to be a useful proxy for biodiversity trends in general.	▸ Exclude those species that show wide fluctuation over time to avoid the situation that very few species influence greatly the Index (WP 5.1.6) ▸ It can be useful to check population trends of groups of species with similar habitat requirement separately (e.g. meadow birds and hedge birds) ▸ Many species may show annual changes in abundance that may reflect a variety of environmental factors, such as extreme weather conditions during the breeding season, poor conditions on the winter grounds, changes in predation pressure, and simple sampling error and statistical noise
Additional indicators – suggestions & MS examples	▸ An additional indicator which could be used in capturing programme impacts, is the share of farmland birds with declining populations (WP 5.1.6). ▸ Further explore population trends of individual bird species that are reported by the Pan-European Common Bird Monitoring project (time period 1980 to 2006) . ▸ Other indicators than birds can help to prove the impact of the AE measures. UK/England is assessing trends in biodiversity decline as measured by farmland and woodland bird species population	If using the additional indicator, share of farmland birds with declining populations, the main indicator (FBI) and the current sub-indicator are based on different data sets (WP 5.1.6): ▸ the sub-indicator highlights and confirms results of the main indicator ▸ the main indicator shows the trend of the populations of farmland bird species collectively, the sub-indicator shows proportion of species with declining populations.

Source: own table

Impact Indicator 5: Maintenance of HNV Farming and Forestry

Aspect	Requirements	Indicator Specifics
Definition	The minimum requirement according to CMEF (Working Paper (WP) 5.2.1) ▸ Baseline Indicator – *"Biodiversity: High Nature Value farmland and forestry"* ▸ Result indicator – *"area under successful land management contributing to biodiversity and high nature value farming/forestry"* ▸ Impact indicator – Changes in high nature value farmland and forestry	▸ The bundling of information stemming from all three indicators up to the programme level is essential (WP 5.2.2) ▸ This information has to be accompanied by qualitative information
Gauging evidence – the assessment	Recommendable methods of measurement (WP 5.2.3) Changes are calculated against a baseline, which can be estimated on the basis of: (a) data on land cover types corresponding to HNV farmland (i.e. semi-natural pastures and meadows; traditional orchards; mosaics of low-intensity crop types; fallow land in low intensity farming systems; natural and semi-natural forests); (b) data on farming practices supporting HNV land (low livestock densities, low fertiliser and pesticide input, lower yields compared to regional averages, presence of understorey in permanent crops); (c) combine HNV criteria in a scoring system at farm holding or municipal level; (d) species data and existing relevees; (e) sample surveys. A combination of these methods should be used for a comprehensive assessment.	▸ The optimal way to identify baseline and trends in HNV areas is likely to vary according to local/regional specifics (WP 5.2.2) ▸ The HNV baseline is defined not only as a number of hectares, but also in qualitative terms (i.e. typology of main HNV farming systems, farming and biodiversity characteristics, socio-economic situation, etc.)
	Data requirement and collection (WP 5.2.4) Existing biodiversity data (census, relevees etc.); grassland surveys; traditional orchards surveys; linear elements (forest inventories); FSS; LPIS-IACS; detailed land cover data; common lands; protected areas; sample surveys of HNV farmland condition and HNV farming practices.	▸ Input data corresponding to the requested period are unlikely to be extensively available. Programme evaluators will have to reconstruct trends on the basis of available information (WP 5.2.2 & 5.2.3) ▸ Need of expert judgement by evaluators ▸ Indicators of the socio-economic situation of HNV farming systems could provide additional insight into trends affecting HNV farmland, and their causes.
Identifying drivers of change	Aggregation from micro-macro (WP 5.2.5) ▸ the availability of data covering the extent of the analysed region (i.e. relevees, biodiversity data, livestock density etc.) at the appropriate scale (farm or municipality) allows for aggregation at the macro-scale.	▸ The counterfactual situation is applicable only if control groups are established in areas where farmers do not participate in RD measures (this concerns data gathering and questionnaires). Due to the high variability of the characteristics of HNV farmland the control groups should be located close to the analysed HNV areas (WP 5.2.5)
	Deadweight, net effects, multiplier effects (WP 5.2.2, 5.2.3, 5.2.5)) To separate the net effect of support from the gross effect, it is suggested to analyse collected indicators separately. ▸ Indicators may reveal conflicting trends, with some indicators pointing to a maintenance of the extent and condition of certain aspects of HNV farming and forestry, whereas others may indicate a decline, or improvement in other aspects. ▸ Programme evaluators will need to make an assessment of the impact of individual RDP measures on each of these trends and use their expert judgement and draw on all of the available information to make an informed assessment of the impact of the programme. Such information is relative to the farming system and the environmental zone where a farm is located.	Simple numerical indicators cannot be devised that will indicate how RDPs are impacting on HNV farming and forestry. Rather, it is a question of using baskets of indicators to gather an understanding of how HNV farmland and systems are evolving, and then of using expert judgement to assess the role rural development measures may be playing in this evolution.

Aspect	Requirements	Indicator Specifics
	▸ Capturing the counterfactual situation is possible through sample surveys (including farmer interviews) conducted on farms that participate in RD measures and farms that do not participate.	
Understanding change & interpretation	The identification of trends is possible through an integrated analysis of all available data, which should allow to link the trends in the spatial distribution of HNV-like land cover classes to trends in farming systems (WP 5.2.5, 5.2.6) ▸ This joint analysis provides the needed information to understand developments occurring in HNV areas, to identify areas where the RD measures have been effective, or hotspots of decline and their causes, which may or may not depend on the application of RDPs (i.e. land abandonment, conversion to other uses, recovery of HNV farmland)	▸ Extensive trend and counterfactual analyses may be available on a narrative basis drawn from the analysis of all available indicators (WP 5.2.5)
Additional indicators – suggestions & MS examples	▸ A cross check with the Farmland Bird Indicator could provide information on the quality of HNV areas. ▸ Indicators of the socio-economic situation of HNV farming systems could provide additional insight into trends affecting HNV farmland, and their causes (WP 5.2.2)	For the socio-economic situation of HNV farming types, besides consideration of the main challenges faced, current perceived tendencies and trends can be useful if examined (WP 5.2.2).

Source: own table

Impact Indicator 6: Improvement in Water Quality

Aspect	Requirements	Indicator Specifics
Definition	<u>The minimum requirement according to CMEF (Working Paper (WP) 5.3.1)</u> ▸ Baseline indicator – Soil Gross Nutrient Balance ○ For the sake of clarity in this summary table soil gross nitrogen balance is addressed but it can apply to phosphorus as well ▸ Result indicator – The soil surface balance calculates the difference between the total quantity of nitrogen inputs entering the soil and the quantity of nitrogen outputs leaving the soil annually. The N surplus results are expressed in kg of N ha-1 of agricultural land ▸ Impact indicator – Change in trend in the soil Gross Nitrogen Balance	▸ The bundling of information stemming from all three indicator types up to the programme level is essential (WP 5.3.2) ▸ This information has to be accompanied by qualitative information
Gauging evidence – the assessment	<u>Recommendable methods of measurement (WP 5.3.3)</u> The farm is the appropriate level to measure the impacts of RD-measures on changes of the GNB (WP 5.3.3).. The most appropriate method to determine empirically the impact of RD measures and combination of RD measures on the change in GNB is the “difference in difference (DiD)” approach (WP 3.3.3.2). ▸ The first step is to select a group of beneficiaries and a control group of non- beneficiaries. The selection is crucial since the level of GNB depends not only on various natural site conditions such as soil and climate but also on specific farm characteristics such as structure and specialisation of production. ▸ In the second step gross soil surface nutrient balance are calculated using the concept described above for beneficiaries and non-beneficiaries. The impact of RD measures on the change in GNB results from a comparison of the development of GNB between both groups. ▸ A third step is to aggregate the impact from single measures and measure combinations at farm level to regional, national and program level. The aggregation method should avoid double counting, deadweight, and displacement effects. The macro level is the farming region or farming territory. A wide range of methods has been developed for assessing the environmental impact of a farming region. ▸ the challenge is to regionalize the data that is only available at sector level e.g. total purchases of mineral fertilizer use from the national agricultural accounts. Such approaches are for example implemented in the agricultural economic sector models such as CAPRI (www.capri-model.org) for the EU 27 NUTS2 regions or in RAUMIS (Heinrichsmeyer et al. 1996) for the NUTS3 regions of Germany. ▸ The advantage of these models is the coherent modelling framework that allows inter alia for corrections of implausible statistical data.	The soil surface balance calculates the difference between the total quantity of nitrogen inputs entering the soil and the quantity of nitrogen outputs leaving the soil annually (WP 5.3.3). The N surplus results are expressed in kg of N ha^{-1} of agricultural land. The annual total quantity of nitrogen inputs includes: ▸ Inorganic or chemical nitrogen fertilizer: quantity consumed by agriculture ▸ Net livestock manure nitrogen production: total number of live animals in terms of different species, sex, age and purpose, multiplied by respective coefficients of the quantity of nitrogen contained in manure/animal/year ▸ Atmospheric deposition of nitrogen: total agricultural land area multiplied by a single coefficient of nitrogen deposited/kg/ha ▸ Biological nitrogen fixation: area of harvested legume crops multiplied by respective coefficient of nitrogen fixation/kg/ha ▸ Nitrogen from recycled organic matter: quantity of sewage sludge applied to agricultural land multiplied by a single coefficient of nitrogen content/kg of sewage sludge The annual total quantity of nitrogen outputs or nitrogen uptake includes: ▸ Harvest crops: quantity of harvested crop production multiplied by respective coefficient of nitrogen concentration ▸ Forage crops: quantity of forage crop production multiplied by respective coefficient of nitrogen concentration ▸ The soil N surplus is therefore estimated as being the difference between N inputs and outputs.
	<u>Data requirement & collection (WP 5.3.4)</u> The annual total quantity of nitrogen inputs includes: ▸ Inorganic or chemical nitrogen fertilizer: quantity consumed by agriculture; ▸ Net livestock manure nitrogen production: total number of live animals in terms of different species, sex, age and purpose, multiplied by respective coefficients of the quantity of nitrogen contained in manure/animal/year; ▸ Atmospheric deposition of nitrogen: total agricultural land area multiplied by a single coefficient of nitrogen deposited/kg/ha;	▸ Ensure data availability on nitrogen inputs and environmental conditions (soil, water etc.) for baseline and impact indicators as early as possible to be safeguarded (WP 5.3.4)

Aspect	Requirements	Indicator Specifics
	▸ Biological nitrogen fixation: area of harvested legume crops multiplied by respective coefficient of nitrogen fixation/kg/ha; ▸ Nitrogen from recycled organic matter: quantity of sewage sludge applied to agricultural land multiplied by a single coefficient of nitrogen content/kg of sewage sludge The annual total quantity of nitrogen outputs or nitrogen uptake includes: ▸ Harvest crops: quantity of harvested crop production multiplied by respective coefficient of nitrogen concentration; ▸ Forage crops: quantity of forage crop production multiplied by respective coefficient of nitrogen concentration	
Identifying drivers of change	<u>Aggregation from micro to macro (WP 5.3.3)</u> ▸ The macro level is the farming region or farming territory. It is identified as the geographic entity with similar geology, soil and climate and the social groups which occupy it and interact there. Therefore, the geographical limits of a farming region can be extremely variable. ▸ If the farm is the micro unit, the farming region is the appropriate scale to evaluate the interactions between farms which constitute an emerging property of agriculture at this organisation scale. ▸ As a consequence, at the farming region level the environmental impact, including the soil N surplus cannot be considered as the simple sum of the impacts of each farm.	The counterfactual situation is hardly applicable (WP 5.3.3 & 5.3.5): ▸ Due to the complexity and site specificity of potential environmental impacts of RD programmes, the identification of control groups and the establishment of a situation with and without the programme in place are very difficult. ▸ The lack of clear systemic borders of effects may lead to less reliable results in both the test and control groups.
	<u>Deadweight, net effects, multiplier effects (WP 5.3.2, 5.3.3, 5.3.5)</u> Separate the effect of RD-measures that are applied under alternative combinations from conditions on the change of GNB. ▸ Due to interdependencies between RDP measures, the total impact (expressed in changes of GNB) cannot be simply calculated as the sum of impacts of single measures. Issues of double counting, deadweight, and displacement play an important role since there are several other factors which might influence the GNB.	The GNB indicates the amount of nutrients that can be potentially emitted into the water and should be interpreted as a potential risk indicator for water quality only (WP 5.3.5). ▸ There are many variables influencing the transfer of nutrients from the soil to the water bodies to establish a direct and simple relationship between GNB and nitrogen concentration in water
Understanding change & interpretation	The gross nitrogen balance represents the theoretical nitrogen surplus in the soil calculated by the difference between the total quantity of nitrogen inputs entering the soil and the quantity of nitrogen outputs leaving the soil annually. The use of gross nitrogen balance as an indicator of the potential N loss to aquatic system is significant (WP 5.3.5). However, the GNB does not inform on the form (organic, ammonia, nitrate) in which nitrogen is in the soil. ▸ If nitrate is the form much more prone to leaching, organic N is rather stable and is a function of the carbon concentration in the soil. ▸ A better evaluation of the N risk to water quality would require estimation/measurement of gas emission (Net Nitrogen Balance). ▸ Ideally, water quality monitoring (nitrogen fluxes measurements at the outlet of agricultural catchments) would be the best method.	

Aspect	Requirements	Indicator Specifics
Additional indicators – suggestions & MS examples	The intrinsic difficulty of relating the change of gross nitrogen balance to a change in water quality is that the N surplus comprises in fact 3 different N components, i.e. the soil N stock, the N leaching to water bodies and the N emitted into the atmosphere. The proportion of each cannot be easily assessed (WP 5.3.6). Yet, this is fundamental to know if the surplus N is: ▸ stored in soil and could be used for further production, or ▸ if it is transferred to water bodies and therefore influences the water quality, or ▸ if it is emitted in the atmosphere as inert gas (N2), potent greenhouse gas (NO, N2O) or as NH3 to contribute to soil and water acidification.	Combining N surplus calculation with real water quality data on nutrient fluxes could help to reduce these uncertainties in future. It would require an adjustment of the sampling strategy of the Water Framework Directive. It would provide true values for N leaching in agricultural areas and reduce the N surplus uncertainty by analysing the real consequence of rural policy on water quality. Examples of the application of additional indicators in Estonia and Latvia are in WP 5.3.6.

Source: own table

Impact Indicator 7: Contribution to Combating Climate Change

Aspect	Requirements	Indicator Specifics
Definition	The minimum requirement according to CMEF (Working Paper (WP) 5.4.1) ▸ 24 Baseline Indicator – *"Production of renewable energy from agriculture and forestry"* ▸ 06 Result indicator – *"Area under successful land management contributing to climate change"* ▸ Impact indicator – Increase in production of renewable energy – measured in units of KtOe (kilotonnes of oil equivalent)	Sub baseline indicators : 25 Usable agricultural area devoted to renewable energy ; 26 air quality/greenhouse gas emissions from agriculture
Gauging evidence – the assessment	Methods of measurement (WP 5.4.3) Emissions reductions can be measured in two main ways: (a) determination of programme-related land areas under relevant biomass and bio fuel crops converted to energetic equivalent (ktoe) using conversion factors; (b) determination of programme related impacts on other emissions sources (e.g. livestock numbers) Specific RDP evaluation experience on climate change is limited, but the measures outlined in WP 5.4.3 are dominated by those involving field cultivation (area/yields). This suggests that existing methods for determining area and yield additionally are applicable for energy crops. Methodologies include: ▸ Quantitative methods: farm scale modelling scenarios, 'DiD' method and/or Propensity scoring of participation or land conversion under programme conditions relative to counterfactual ▸ Qualitative methods: farm interviews, reflective comparisons for farmers who are growing crops or who have installed capacity in biogas/wind/hydro	Contrasting evaluation approaches are offered by Netherlands, Austria and Spain (WP 5.4.3). ▸ These examples were in agreement that climate change impacts can be delivered through measures in all three programme axes.
	Data requirements & collection (WP 5.4.4) Data sources for all sources outlined in WP 5.4.3 are relatively good: ▸ Farm scale data on land under specific crops (FADN) ▸ Data can be partitioned in a variety of ways, e.g. before/after programme; farm type and size ▸ Information on installed capacity (biogas and wind) ▸ Conversion factors to express biomass/gas/wind in terms of tonnes of oil equivalent ▸ Note on assumption: KTOe is measured at the farm gate For wind/biogas generation, a distinction is made between energy use on farm and whether energy is exported to a national grid. For the latter the amount of renewable energy generated is based on: (a) metering; (b) calculations based on installed capacity and average load factors;	Where there aren't meters or a verified installed capacity, to determine this information, farmers and other land managers would be required to submit information of compliance with specific measures. This information could be subject to surveillance using systematic or randomised farm surveys and/or possible forms of triangulation using GIS or satellite data on land use. The same mitigation evaluation procedure could be incorporated into the evaluation procedure

Aspect	Requirements	Indicator Specifics
Identifying drivers of change	Aggregation from micro-macro (WP 3.3.3 & 3.3.4) ▸ Quasi experimental methods (PSM in combination with DiD) – see Chapter 3.3.3 ▸ Modelling approaches – farm linear and or dynamic programming (see Chapter 3.3.4.5) ▸ Additional sources of information needed – sufficient number of case studies – to be extrapolated onto the macro scale	To provide compelling evidence of causal links between RDPs and renewable capacity and to control for intervening variables, a counterfactual scenario can be constructed using a control group of non-RDP recipients matched to the RDP recipients using farm datasets (FADN etc.) (WP 5.4.3). Another approach would be to use farm scale modelling to assess the financial performance of different renewable energy investments on representative farm types.
Additional indicators – suggestions & MS examples	KtOe is a limited indicator that relates to the way that biomass fuels displace emissions from the combustion of fossil fuels. This indicator is not suited to capture the mitigation of methane and nitrous oxide from other programme measures. Carbon dioxide equivalent (CO_2e) is a more comprehensive indicator for capturing these impacts.	An example (WP 5.4.4) is provided of the ways in which measures in the UK-Scotland Rural Development Programme could abate GHG emissions.

Source: own table

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