FARM-LEVEL INDICATORS FOR EVALUATING SUSTAINABILITY AND EMERGING NEW POLICY TOPICS

Public

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FLINT is funded by the European Commission's 7th Framework Programme, Contract no. 613800

ABOUT THE FLINT PROJECT

FLINT Farm Level Indicators for New Topics in Policy Evaluation.

PROJECT SUMMARY

Given the continual evolution of the CAP and the current reform that is on-going, it is now both timely and relevant to take stock of current evaluation practices and specifically focus on which indicators that are or can be employed to aid our understanding of the relative success of policy targeting. This is the means by which "to obtain an in-depth picture of the impact of the CAP at farm level", in order "to better align the [CAP post-2013] policy to the objectives and targets of the Europe 2020 Framework". Two precise examples are given in the tender specification document – innovation and resource efficiency – but the list by extension also covers agricultural (economic) viability and environmental sustainability. The logical platform from which to develop the suite of indicators, as proposed in FLINT, is the EU Farm Accountancy Data Network (FADN), which is the existing data infrastructure for the CAP.

FLINT will first consider existing policy measures and accompanying methodologies, such as agri-environmental indicators per se or the Common Monitoring and Evaluation Framework (CMEF) covering the CAP as a whole; in this sense the contribution of other sources, such as the OECD, or other initiatives, such as EU strategies or MS schemes, which are related to farm-level practice and outcomes, must also be taken into account. Following the analysis of policy evaluation needs, FLINT will review the data and indicators currently available through FADN sources and will identify gaps and deficiencies in the current data availability.

The stock of variables available in the various Member State FADN datasets varies and the capacity/willingness of the various countries to collect additional data is also variable. Hence a pilot in numerous countries with different data collection methods and coming from different starting points is required. Such a pilot can only be tested effectively through on-farm data collection on farms. This pilot will provide invaluable information about the operational structure and time-frame required to collect such data and develop such indicators.

The value-added of the newly developed indicators will be tested in the analysis of a number of policy analysis scenarios. Hence, FLINT will make a contribution to enhancing the policy analysis capabilities for the CAP policy assessment, useful for the Commission within an operational perspective covering the entire EU.

The objective of FLINT is to establish a tested data-infrastructure with up to date farm level indicators for the monitoring and evaluation of the CAP and contribute to a better targeting of CAP and other related policy measures.

Specifically the objectives of FLINT are to:

1. Assess current and future policy evaluation needs
2. Review the data available to facilitate policy evaluation and identify any data gaps
3. Pilot the collection of additional farm level data through the FADN under 3 different data
4. collection administrative environments.
5. Test the farm level indicators for policy evaluations
6. Make recommendations about the future data collection in the EU

PROJECT CONSORTIUM:

- Wageningen University & Research Center - The Netherlands
- Agrargazdasagi Kutato Intezet- Hungary
- LUKE – Finland
- Instytut Ekonomiki Rolnictwa I Gospodarki Zywnosciowej-Panstwowy Instytut Badawczy – Poland
- Instituto Navarro de Tecnologias e Infraestructuras Agroalimentarias SA – Spain
- Leibniz-Zentrum fuer Agrarlandschaftsforschung (Zalf) E.V.- Germany
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FARM LEVEL INDICATORS FOR NEW TOPICS IN POLICY EVALUATION: FLINT

The purpose of this report is to document the process adopted by the FLINT project partners in selecting a set of indicators to provide information to evaluate new policy topics.

FLINT aims to provide up to date information for policy evaluation on farm level indicators of sustainability and other new relevant and emerging topics. The project is designed to provide updated data-infrastructure needed by the agro-food sector and policy makers for the purpose of evaluating new and emerging policy topics. In Europe the Common Agricultural Policy (CAP) is likely to be a driver of sustainability as it has progressively introduced more environmental and social policies with various CAP reforms over the past two decades. There is a clear and increasing need for sustainability information at farm-level by national and international agro-food and retail sectors. The focus is to improve decision making and to anticipate and identify relevant future policy needs. This is facilitated by identifying and defining a list of indicators for evaluation. The indicators address the performance of farms on a wide range of relevant topics.

The indicators are selected using a three stage process: identification of existing policy needs, review of current literature and feedback from FLINT partners. This report focuses on the first two stages of the indicator selection process. This report first identifies the policy priorities and needs for evaluating European agriculture indicators and then presents a wish list of indicators, compiled through a process of conducting a comprehensive literature review and incorporating partner's scientific expertise of farm level data collection. The methodology applied is a three stage process which aims to collectively identify *what* should be collected and *why*. The first step draws on existing literature and national initiatives on measuring farm sustainability. The second stage focuses primarily on the scientist view and finally the first set of indicators is derived. Selected indicators are subsequently piloted on approximately 1,000 existing Farm Accountancy Data Network (FADN) farms. The pilot network is representative of farm diversity at EU level, including the different administrative environments in the different Member States that gather these data. The lessons learned and recommendations from the empirical research conducted in nine purposefully chosen European member states will be used for estimating and discussing effects in all member states.

The project is supported by an advisory board in which the agro-food sector actively participates. The advisory board provide an additional feedback for indicator selection.

The contributions of all nine partner countries of the FLINT project: Finland, France, Germany, Greece, Hungary, Ireland, the Netherlands, Poland, and Spain throughout this process are acknowledged.

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INTRODUCTION

The future of European agriculture stretches far beyond economic prosperity alone. It is widely accepted that the production of agricultural goods and services in Europe is influenced by issues beyond the farm gate. Agriculture is considered part of the wider countryside and there is a high diversity of farming systems across the European countryside. Climates, land-use systems, farm management practices, cultural and historical differences all impact on the rural countryside and consequently on agricultural activities. Conversely the agricultural activities lead to impacts on the country side beyond the farm gate. The role of environmental legislation is well established in agricultural policies for the protection of the environment for future generations within Europe. European legislation is implemented nationally and tailored to environmental conditions at Member State level. Monitoring and evaluation of policy must reflect the considerable level of change in rural and agricultural policy, largely contained within the CAP. One of the overarching aims of the FLINT project is to look forward at new and emerging policy topics that must be considered to: identify the policy needs for effective evaluation; identify the information gaps which currently exist, and; anticipate future policy needs. The requirements for additional data are also considered in terms of the additional burden placed on farmers and so access to existing data infrastructure forms a significant part of the process. The development of a list of farm level indicators that reflect the data variables required to conduct policy analysis is based on the inputs of all FLINT partners.

The aim of FLINT is to provide the agro-food sector and European policy makers with an updated data-infrastructure required for the evaluation of farm-sustainability and new and emerging policy topics. The relevant topics for sustainability identified by FLINT include: (1) market stabilization; (2) income support; (3) environmental sustainability; (4) climate change adaptation and mitigation; (5) innovation; and (6) resource efficiency.

Agricultural policy needs are based on the CAP rural development policy priorities. Beyond identified policy needs, other topics of interest are identified from industry initiatives, existing available data sources and existing scientific evidence from literature, with the objective of identifying a scientific list of farm-level indicators under the topics outlined above (1-6). The list of desirable indicators presented and discussed here is referred to as the Indicator Wish List. This list forms the basis of our stakeholder engagement process (WP 2). The final selection of indicators explicitly considers the heterogeneity of the farming sector in the EU and its member states.

The report is structured as follows: section one outlines policy priorities; it also identifies possible gaps between existing data infrastructure, mainly FADN, and new and emerging policy needs. The second section provides details of the literature review. The final section of this report includes the final wish list which focuses on what is collected and why, with a suggested approach to meeting the data needs necessary to conduct policy analysis for all 33 identified indicators.

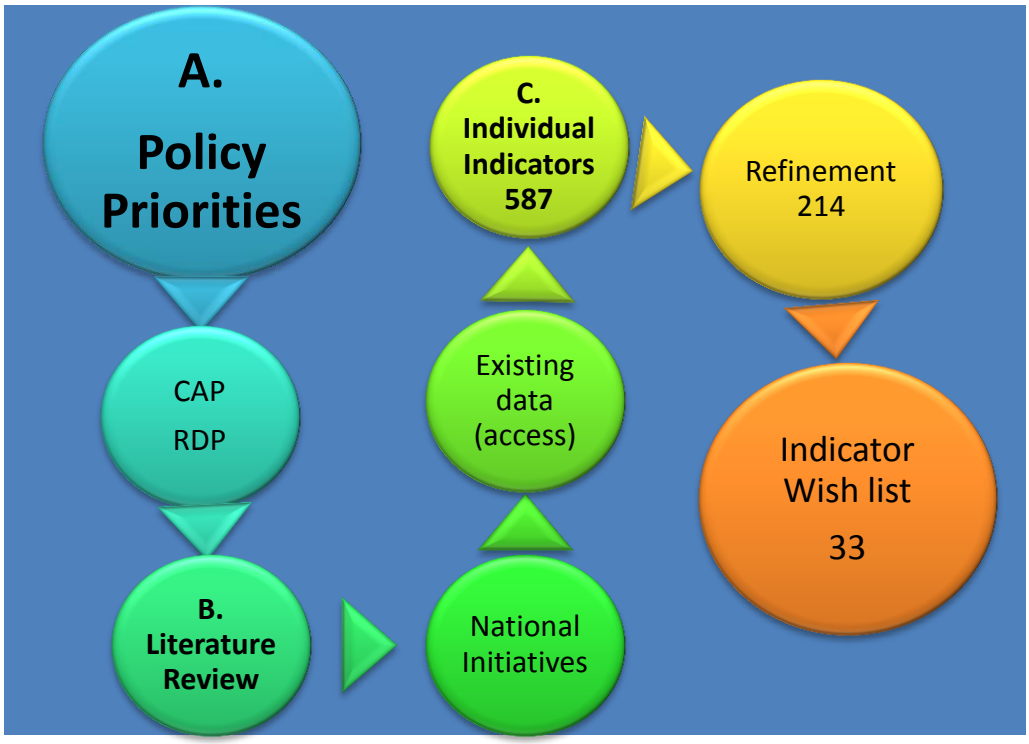
1 METHOGOLOGICAL APPROACH

1.1.1 Methodological Overview

The methodological process of finding good indicators on new topics in policy evaluation is depicted in Figure 1 in three stages A. Policy, B. State of the art and C. Indicator identification and development. All project partners contributed to the indicator identification process specifically through their contributions to the national initiatives and the identification of indicators relevant under the six themes identified:

- market stabilization
- income support
- environmental sustainability
- climate change adaptation and mitigation
- innovation
- resource efficiency.

Figure 1: Indicator Identification Process



2 PROCESS OF SELECTION

2.1 A. Policy

CAP support measures have undergone much reform most notably the MacSharry reform 1992, Agenda 2000 and Fischler reform 2004. Over this period, the CAP objectives have evolved from having a primary focus on food security and protection of farmers' livelihoods to incorporating multifunctional agriculture and the wider countryside to ensure the sustainability of farming and rural development. CAP objectives are being amended again as part of the post-2013 programme. The identification of Europe's future policy needs in this report specifically focus on the CAP for the 2014-2020 period and Europe 2020. The purpose of this section is to describe future needs of policy analysis for example greening of the CAP, income equity and innovation in the agri-food sector. Priority topics are based on the CAP Rural Development Policy (RDP) and other CAP policies, including competitiveness which impinges across the agro-food sector. Given the continual evolution of the CAP and the current reform, it is both timely and relevant to take stock of current evaluation practices and specifically focus on indicators that are or can be employed to aid our understanding of the relative success of policy targeting. In this section the potential use of the EU FADN as an evaluation tool is considered to better assess achievement of the various objectives of the CAP.

2.1.1 Collating policy priorities

Existing EU policy priorities are identified on the basis of the CAP and more specifically the RDP policies. In examining the evolution of the CAP and its monitoring and evaluation framework, existing data infrastructure is considered, specifically the FADN as the main evaluation tool used for CAP. The overlap between the FADN and the existing and future data requirements are considered. The data farm returns in FADN are lacking in terms of their power to evaluate many new and emerging topics. Table 1 displays the template used to identify policy evaluation needs across Europe. Each partner member state contributed to identifying European policy, programmes and national initiatives which address farm level sustainability. The templates informed the choice of FLINT policy priorities. Table 2 outlines the main relevant policy areas discussed by FLINT and based on the RDP policies 1-6 (see list below) and coverage of the topic in FADN. This is the first step in the process of identifying gaps between the current data infrastructure for evaluating CAP, the FADN, and the new and emerging policy priorities as outlined by FLINT for future CAP evaluation.

1. Fostering knowledge transfer in agriculture, forestry and rural areas
2. Enhancing the competitiveness of all types of agriculture and enhancing farm viability
3. Promoting food chain organisation and risk management in agriculture
4. Restoring, preserving and enhancing ecosystems dependent on agriculture and forestry
5. Promoting resource efficiency and supporting the shift towards a low-carbon and climate-resilient economy in agriculture, food and forestry sectors
6. Promoting social inclusion, poverty reduction and economic development in rural areas

Table 1: Template used for Evaluation Needs

Title	*Title of policy being addressed*
Reference	*Document title, URL*
Description	*Brief description of the main objectives or strategic aims*
Policy evaluation needs	*Brief description of some of the high-level evaluation needs, or evaluation questions*
Information needs to address policy evaluation	*Brief description of the information that is needed to conduct an effective policy evaluation, with an emphasis on policy topics and information needs that are relevant to farm-level operations and data collection*
Candidate topics for farm-level indicators	*Brief description of topics encountered that are relevant to the identification of farm-level indicators, and indicators with potential for inclusion in FLINT*

Table 2: Overview of some of the main EU policies and topics that are relevant to farm-scale sustainability

Policy	Examples of information needs	FADN coverage
RDP Priority 1: Fostering knowledge transfer in agriculture, forestry and rural areas	• Evidence of efforts to close the innovation gap between research and practice • Engagement in: European Innovation Partnerships (EIPs); co-operation activities; clusters or networks, and; operational groups • Incidence of trials and pilot projects to support innovation • Adoption of innovative actions • Measures to reduce risks and barriers • Increased profitability and competitiveness due to innovation • Social Return on Investment (SROI) • Co-operation operations continuing after RDP support • Agriculture holdings with RDP support for investments regarding modernisation • RDP support for business development plan for young farmers	Possibly good for those involving direct RDP payments, but otherwise very low
RDP Priority 2: Enhancing the competitiveness of all types of agriculture and enhancing farm viability	• Economic performance of farms • Measurement of farm structures • Measurement of farm modernisation • Degree of farm diversification • Profiles of age structures in the agricultural sector • Support for investment by young farmers	Very good coverage
RDP Priority 3: Promoting food chain organisation and risk management in agriculture	• Participation in quality schemes for products and food • Local and regional branding of products • Participation and contribution to short supply chains (e.g. direct sales, local markets) • Participation in producer groups • Marketing of local produce • Targeting of knowledge, training and skills for new entrants and existing producers • Targeting of financial support to assist short supply chains • Use of LEADER to support local food sectors • Participation in risk prevention and management schemes • Knowledge and information on access to RDP finance instruments other than non-repayable grants • Use of RDP finance instruments other than non-repayable grants (e.g. revolving loan fund, venture capital fund, interest rate subsidy, guarantee fund, equity fund)	Generally very low coverage in the core FADN
RDP Priority 4: Restoring, preserving and enhancing ecosystems dependent on agriculture and forestry	**Environment indicators*** • 31. Land cover (Crop type for example wheat barley: Table K) • 32. Less favoured areas (Majority of holding >50% response is binary Y/N: Table A Q39) • 33. Farming intensity (Possible to calculate though using Livestock units per hectare : Table N and B)	Generally absent in the core FADN. 31-34 are partially available in FADN. The issue is the level

Policy	Examples of information needs	FADN coverage
	• 34. Natura2000 areas Available: Table A Q45 • 35. Farmland birds index (FBI) (not a farm-scale indicator) • 36. Conservation status of agricultural habitats (grassland) • 37. HNV farming • 38. Protected forest • 39. Water abstraction in agriculture • 40. Water quality • 41. Soil organic matter in arable land (current indicators are output of modelling exercise) • 42. Soil erosion by water (current indicators are output of modelling exercise) **Other possible indicators** • Proportion of farm area occupied by Natura2000 • Proportion of farm area occupied by some other legislative designation for wildlife • Proportion of farm area occupied by semi-natural habitats • Presence on the farm of a species or habitat of high wildlife value • Participation in biodiversity measures of an agri-environment scheme • Participation in water quality measures of an agri-environment scheme • Participation in soil quality measures of an agri-environment scheme • Training in issues related to wildlife or habitat maintenance • Provision of advice related to wildlife or habitat maintenance • Training in issues related to water quality • Provision of advice related to water quality • Training in issues related to soil quality • Provision of advice related to soil quality	of detail collected. Current level of data collected is not sufficient to address RDP priority 4.
RDP Priority 5: Promoting resource efficiency and supporting the shift toward a low-carbon and climate-resilient economy in agriculture, food and forestry sectors	• Share of irrigated land switching to more efficient irrigation system *(target indicator)* • Increase in efficiency of water use in agriculture in RDP supported projects (m3 water used/standard output/) *(complementary result indicator)* • Increase in efficiency of energy use in agriculture and food-processing in RDP supported projects (output/MJ energy used) *(complementary result indicator)* • Total investment in renewable energy production (€) *(target indicator)* • Renewable energy produced from supported projects (tonnes of oil equivalent) *(complementary result indicator)* • Livestock units concerned by investments in livestock management in view of reducing the N_2O, methane and ammonia emissions *(target indicator)* • Share of agricultural land under management contracts targeting reduction of N_2O, methane and	Generally no or very low coverage in the core FADN

Policy	Examples of information needs	FADN coverage
	ammonia emissions *(target indicator)* • Reduced emissions of methane and nitrous oxide (measured in CO_2 equivalent) *(complementary result indicator)* • Reduced emissions of ammonia from agriculture (tonnes) *(complementary result indicator)* • Share of agricultural and forest land under management contracts contributing to carbon conservation and sequestration *(target indicator)*	
RDP Priority 6: Promoting social inclusion, poverty reduction and economic development in rural areas	• Jobs created in supported projects *(target indicator)* • Share of rural population covered by Local Action Groups (LAG) funded through the RDP *(target indicator)* • Rural population benefiting from improved services / infrastructures supported under the RDP *(target indicator)* • Jobs created in supported projects (LEADER) *(target indicator)* • Rural population benefiting from new or improved services / infrastructures (ICT) *(target indicator)*	Some coverage in the core FADN
ICT for Competitiveness and Innovation And Key Enabling Technologies	• Adoption of ICT to improve farm business • Farm-level adoption of key enabling technologies	Generally no or very low coverage in the core FADN
Tourism	• Farm income generated from tourism • Proportion of farm labour dedicated to agri-tourism • Investment in agri-tourism • Membership of agri-tourism certification scheme, co-operative, LAG or LEADER project	Some coverage in the core FADN
Animal Welfare	• Use of RDPs to support investment and aid adaptation to higher standards in the farming sector, as well as to reward practices that go beyond minimum standards • Farmers' awareness of animal welfare programmes • Adherence to animal welfare rules on the farm, during transport and at time of slaughter or killing (with specific rules for laying hens, calves, pigs and broilers) • Participation in RDPs to support investment and aid adaptation to higher animal welfare standards in the farming sector • Participation in activities to inform consumers about animal welfare standards and influence consumers' purchasing decisions	Generally no or very low coverage in the core FADN
EU Animal Health Strategy (AHS)	• Farm-level incidence of disease outbreaks • Farm-level investment in precautionary measures for biosecurity for animal health • Participation in an eradication programme for named diseases (listed in AHS) • Participation in electronic identification schemes for traceability of live animals (to replace paper	Generally no or very low coverage in the core FADN

Policy	Examples of information needs	FADN coverage
	certification) • Receipt of effective training to be able to identify the signs of disease at an early stage • Receipt of information/training to improve farm-level surveillance of disease	
Plant Health	• Inspection of pesticides application equipment in use – All pesticides application equipment will have to be inspected at least once by 2016 to grant a proper efficient use of any plant protection product • Adherence to EU plant health rules • Actions to prevent incidence of plant pests and diseases • Incidence of alien invasive species • Support for surveillance and control systems for plant pests and diseases	Generally no or very low coverage in the core FADN

Note: Here, we indicate the policy, and provide some examples of the farm-scale information needs associated with that policy.
The final column provides a brief and subjective comment on the degree to which FADN currently addresses these farm-scale policies and topics.
* These codes correspond to those used by the European Commission in their draft list of indicators for the RDP. *http://ec.europa.eu/agriculture/cap-post-2013/monitoring-evaluation/documents/proposed-list-common-context-indicators_en.pdf*

Source: the authors

There are clear gaps between the policy priorities and the existing data infrastructure required to develop metrics for policy evaluation at farm level. The only existing farm-level data from the existing FADN which has good coverage relates to farm economics. Sustainability at farm level however is more than pure economics. Topics with no coverage in FADN are notably the environmental, animal welfare, technology and innovation topics. These areas in particular are important for the future. This is outlined in the next section which addresses the broader definition of sustainability and national initiatives that have measured such topics at farm level.

2.2 B. Literature Review

Generally there are many challenges associated with the definition of sustainability as a concept. The review of sustainable indicators for agriculture including national farm-level sustainability initiatives discusses such issues. Specifically through focusing on agriculture it identifies how sustainable development is identified at farm-level along three balanced pillars of sustainability: environmental, economic and social. It addresses the challenges and complexity associated with development of indicators for sustainability at farm-level. Such challenges include the operationalization measurement compounded by the need for using a harmonised approach to facilitate policy evaluation across all European member states. Finally it discusses the industrial initiatives and the remaining gaps which exist.

The process of collating literature involved the input of all FLINT partners using a template report (Table 3). The synopsis of suggested literature and national initiatives from their respective countries provided a summary of relevant literature but also an opportunity to reflect the usefulness and feasibility to measure farm-level sustainability.

Table 3: Template used for Literature Review

Category	Information Required
FLINT contributors	Name of institute FLINT contact person
Source	Reference Web link Type of document (e.g. article, report, book) Peer reviewed (Yes/No)
Overall description of the study	Context Purpose of study Policy assessed Description of methodology (present data required for method) Details of implementation (source of data, period studied, strengths, weaknesses, future planned research as a result).
Indicators development	Indicators used (composite or aggregated, identify established indicators/approaches, newly created).
Spatial scale	Level of analysis, type of farming system implemented on, details on farm numbers used (size and scales)
Feasibility of the study in the context of FLINT	Partner assessment

2.2.1 Definition of sustainability for agriculture

Reflecting the established pillars of sustainability, the contribution of sustainable agriculture is threefold.

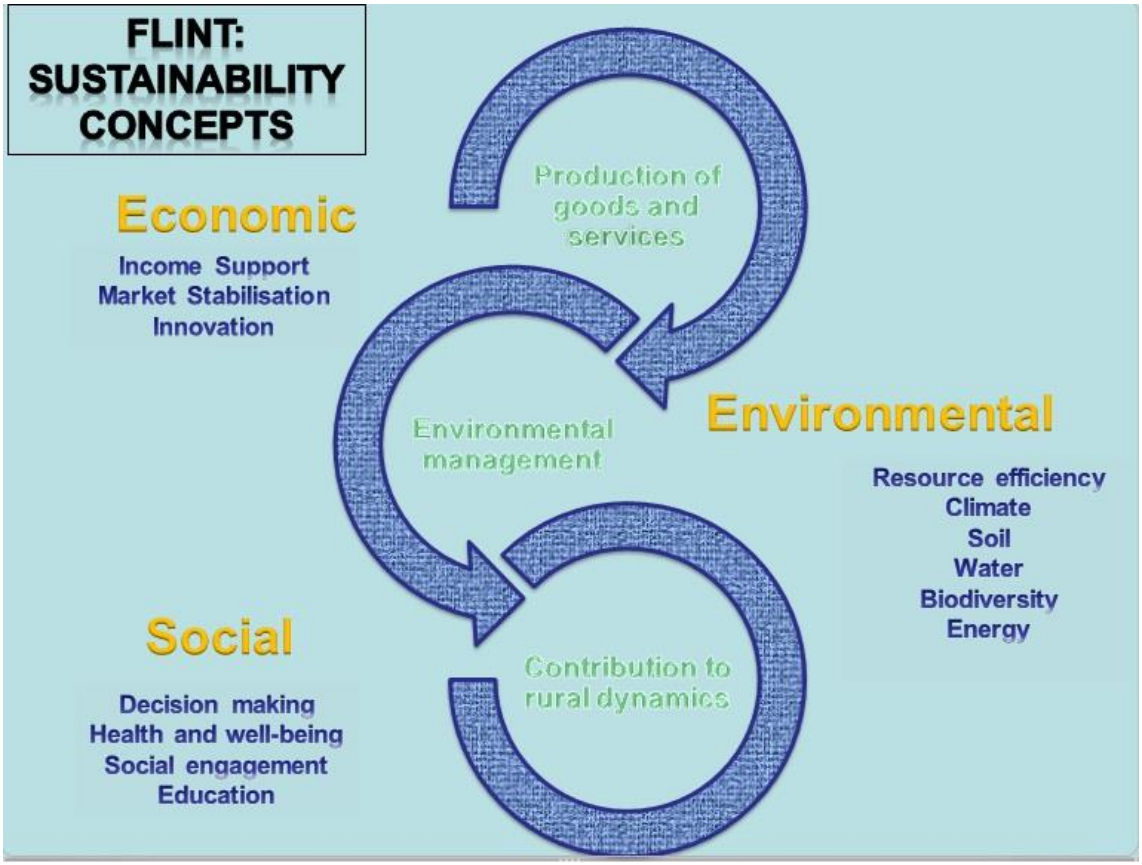
Viewed from the perspective of the farm as having three functions, sustainable agriculture involves:

- the production of goods and services (economic function) ;
- the management of natural resources (ecological function) ;
- the contribution to rural dynamics (social function).

The harmonious combination of these three interconnected functions constitutes the background of sustainable agriculture. To move towards sustainability, it is necessary to progress simultaneously along all three dimensions. Since these three functions are linked, the improvement (or maintenance) of the

economic performance alone is meaningless if it does not come together with an improvement (or maintenance) of environmental and social performances: the economic profitability of a production system is not sufficient to compensate high ecological and social costs (Vilain, 1997).

Figure 2: Agricultural Sustainability and FLINT



Source: the authors

2.2.2 Indicators defined and discussed

Whether of a quantitative or qualitative nature, indicators are defined as metrics of a very diverse nature (data, calculations, observations, measurements), which provide information about complex concepts and systems. Indicators are summary measures which combine raw data on a an issue which is important for policy makers, which include validated knowledge ranging from raw data through to calculated indicators and formalised models varying in the degree to which they summarise information (OECD, 2001). Defined as such, indicators are intended to assist users in their actions, effectively communicating and sharing information to users including policy makers, stakeholders and society.

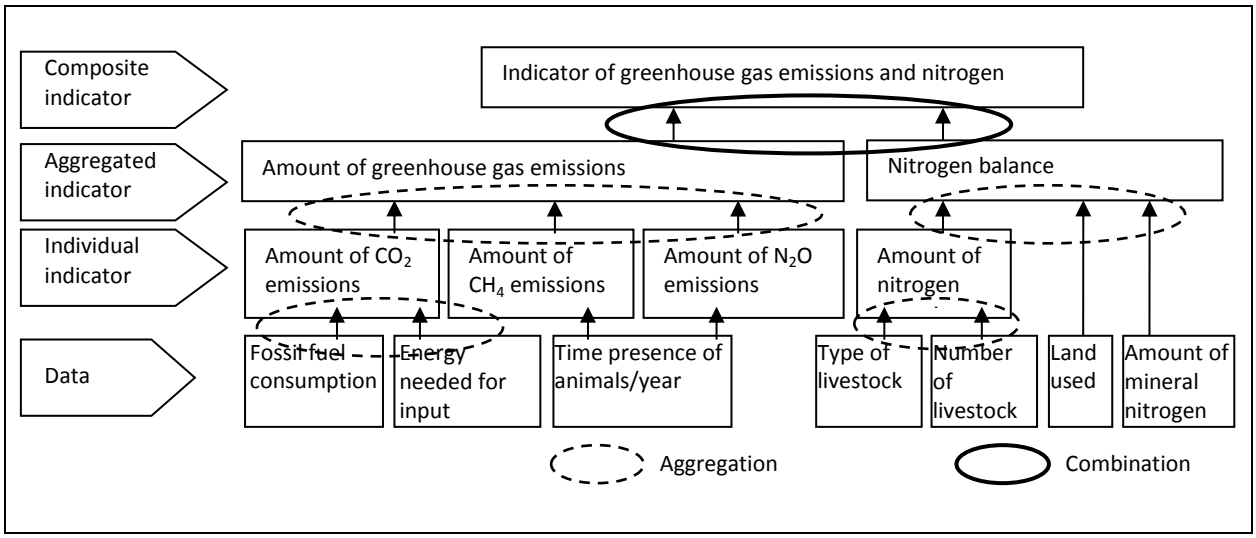
In practice, indicators of agricultural sustainability are quantifiable and measurable attributes of a system that are judged to be related to its sustainability. They are 'statistical constructs which support decision-making by revealing trends in data' (Dillon *et al*., 2014). The last fifteen years have seen an international proliferation of assessment methods based on sets of indicators to assess various issues under one or more dimensions of sustainability (over 200 identified, see Rosnoblet *et al*., 2006) or to evaluate a specific problem (Bockstaller *et al*., 2009a).

Based on the literature review, we technically define indicators as in Gras *et al*. (1989) as variables (qualitative/quantitative data observed, measured or calculated from other variables) which supply information on other variables (criteria) which are more difficult to get access to, and can be used as a

benchmark to make a decision, while we understand methods as procedures for the assessment of sustainability through the definition and the calculation of indicators.

Focusing on the farm level, various levels of indicators can be considered on which clarification is necessary. While individual indicators are built from raw/input data, these individual indicators may be aggregated to form aggregated indicators. Composite indicators are then the combination of individual or/and aggregated indicators representing different dimensions of sustainability (Saisana and Tarantola, 2002; Nardo *et al*., 2005). **Figure** 3 illustrates these concepts.

Figure 3: From raw data to composite indicators: an illustration



Source: the authors

In effect the indicators chosen in this project include a mix of data types, some requiring raw data alone such as energy. These raw data feed into the calculation of various other composite measures. Other aspects of the same raw data may also be of interest in terms of sustainability, for example it is also of interest to know the source of energy input. This is reflective of the long term sustainability on the farm relating to supply and potentially the reliance on this source relative to other energy inputs. Gathering additional data is another important aspect as it reflects the risk of using finite resources.

2.2.3 National Initiatives

A selection of national initiatives identified by FLINT partner countries, (Finland, France, Germany, Greece, Hungary, Ireland, the Netherlands, Poland, and Spain) displayed in Table 4 complements the literature review based on theoretical knowledge, with national examples. It provides an illustration of the concepts and gives insights from practical applications.

National initiatives are separated into three categories based on use:

(1) indicators used for farm decision support (internal monitoring) which are based on the specific characteristics and issues of each farm. These indicators are used to guide decisions regarding the techno-economic systems;

(2) indicators used for comparing farms and for benchmarking (inter-comparison) (although we acknowledge that benchmarking can also be used for farm decision support);

(3) indicators used for policy evaluation, which can bring information on the impact and efficiency of policies in order to justify their creation or improve their implementation.

Table4 lists the national initiatives in each of the three categories.

Table 4: Classification of the national initiatives according to their use of indicators

Farm decision support	Farm comparison	Policy evaluation
Ex-ante analysis • Foley *et al*. (2011) (IR) • Terrier *et al*. (2010) (FR) *Current on-farm management identification* • INTIA S.A. (2014) (ES) *Ex-post analysis* • AgriClimateChange (2013) (DE, ES, FR) • Agro-Transfert Ressources et Territoires (2009) (FR) • Aguilar *et al*. (2013) (ES) • Fortun-Lamothe (2012) (FR) • Kool *et al*. (2010) (NL) • Kramer *et al*. (2006) (NL) • Ripoll-Bosch *et al*. (2012) (ES) • Zafiriou *et al*. (2012) (GR)	Benchmarking of farms' performance **Global performance** • Arandia *et al*. (2011) (ES) • Batalla *et al*. (2013) (ES) • Carbon Navigator (2014) (IR) • Dantsis *et al*. (2010) (GR) • Feret (2004) (FR) • Foley *et al*. (2011) (IR) • Fourrié *et al*. (2013) (FR) • Galan *et al*. (2007) (FR) • Molnar (2008) (HU) • Pervanchon (2004a) (FR) • Pervanchon (2004b) (FR) • Zahm *et al*. (2008) (FR) **Social performance** • Fourrié *et al*. (2013) (FR) • Mollenhorst *et al*. (2006) (NL) • Tömpe (2008) (HU) • Zegar and Wrzaszcz (2012) (PL) **Economic performance** • Dillon *et al*. (2008) (IR) • Ehrmann (2008) (DE) • Molnar (2008) (HU) • Ryan at al. (2014) (IR) • Thomassen *et al*. (2009) (NL) • Wrzaszcz (2012 and 2014) (PL) • Zegar and Wrzaszcz (2012) (PL) **Environmental performance** • Fourrié *et al*. (2013) (FR) • Kool *et al*. (2010) (NL) • Sintori *et al*. (2013) (GR) • Zafiriou *et al*. (2012) (GR) Certification of farms • Bord Bia (2014) (IR) • Breitschuh (2008) (DE) • DLG e.V. (undated) (DE) • Ministère de l'Agriculture (2014) (FR) Factors influencing farm performance • Dolman *et al*. (2012) (NL) • Dolman *et al*. (2014) (NL) • Ligda *et al*. (2013) (GR) • Ripoll-Bosch *et al*. (2012) (ES) • Sintori *et al*. (2013) (GR) • Wrzaszcz (2012, 2013 and 2014) (PL) • Zegar (2013) (PL)	Measuring the impact of policies • Bergschmidt and Schrader (2009) (DE) • Casey and Holden (2005a) (IR) • Casey and Holden (2005b) (IR) • Kovács *et al*. (2013) (HU) • Manos *et al*. (2011) (GR) • Manos *et al*. (2013) (GR) • Mauchline *et al*. (2012) (DE, FI, GR, HU, IR) • Pesti and Keszthelyi (2009) (HU) • Primdahl *et al*. (2003) (DE, ES, FR, GR) • Tzanopoulos *et al*. (2011) (GR) • Westbury *et al*. (2011) (IR) • Wisman and Blokland (2013) • Zalidis *et al*. (2004) (GR)

Note: Finland (FI), France (FR), Germany (DE), Greece (GR), Hungary (HU), Ireland (IR), the Netherlands (NL), Poland (PL), and Spain (ES).

Note: For full references see FLINT deliverable 1.2 – Literature review

Source: the authors

2.2.4 Industrial initiatives

Agriculture is subject to many standards that relate to farm-and sector-scale practices. The International Trade Centre Standards provides information on voluntary sustainability standards, codes of conduct and audit protocols that address sustainability in global supply chains. The programme objective is to strengthen capacity for all actors to participate in more sustainable production and trade. The online mapping tool[1] displays 52 standards which exist for agricultural products and services within the EU (Table 5). The chosen criteria are: Product/Service: "All Agricultural Products", Producing Country: "Europe", Destination Market: "Any country or region". When narrowing the Destination Market search options to "Europe" three standards are not included, (USDA National Organic Program, Global Reporting Initiative (GRI) and Climate, Community & Biodiversity Standards - CCB Standards). Seventeen standards apply directly to farm level activities.

Table 5 Industrial Standards in Agriculture

International Trade Centre Standards Mapping tool found at http://www.standardsmap.org/identify	
Bio Suisse.	
BRC Global Standards - Consumer Products.	
Business Social Compliance Initiative Code of Conduct BSCI's	
Chinese National Organic Products Certification Program	
Climate, Community & Biodiversity Standards - CCB Standards	
EcoVadis.	
Ethical Trading Initiative – ETI.	
EU Organic Farming Organic farmers	
Fair Flowers Fair Plants – FFP	*
Fair for Life	
FairWild.	*
FLA Workplace Code of Conduct.	
FLORIMARK GTPMPS	*
Forest Stewardship Council – FSC.	*
Global G.A.P. Livestock	
Global Organic Textile Standard	*
Global Reporting Initiative (GRI).	
GLOBALG.A.P. Crops	
GLOBALG.A.P. Floriculture.	
GMP+ Feed Certification scheme	*
Green Food China Green Food Development Centre, China	
Guide on Social Responsibility for Chinese Int Contractors	
IFOAM Standard.	
IFS Food.	
International Labour Organization Labour Standards.	
ISCC EU (sustainability and greenhouse gas emissions)	
ISCC PLUS (food, feed, technical/chemical bioplastics and bioenergy)	

[1] http://www.standardsmap.org/identify

KRAV (organics)	
LEAF Marque LEAF	
MPS-ABC	
MPS-GAPMPS	
MPS-Socially Qualified (SQ) MPS	
Naturland.	
NTA 8080-	*
OECD Guidelines for Multinational Enterprises	
ProTerra Foundation	
Round Table on Responsible Soy Association	**
Roundtable on Sustainable Biomaterials – RSB	*
Roundtable on Sustainable Palm Oil - Supply Chain Certification	**
Safe Quality Food Program – SQF.	
SAI Platform –Sustainable Agricultural Initiative.	
Sedex Global (Supplier Ethical Data Exchange)	
Sedex Members Ethical Trade Audit – SMETA.	
Small Producers Symbol.	
Social Accountability International	
Soil Association organic standards.	
UN Global Compact	
Unilever Sustainable Agriculture Code	
USDA National Organic Program	
Verified Carbon Standard - VCSVCS	
WFTO Guarantee System	
ZeryaZerya®	*

* not main food crop/system

** not produced in the EU

Standards are marked as food or non-food crops, many of these initiatives assist producers in monitoring the sustainability of their business. For example the Roundtable on Sustainable Biomaterials – RSB provides members with a tool to calculate GHG emissions. Other initiatives actively ensure security across the chain such as the GMP+ Feed Certification Scheme focusing on safety and responsibility. The introduction of such standards for inputs is not necessarily directly related to farm level activity; however, such standards strengthen relations across the chain and have a positive impact on sustainability at farm-level. Standards which apply at the farm level include the Global Good Agricultural Practice (G.A.P.) standards for Livestock, Floriculture and Crops that was developed for application to global agriculture. It is a harmonised certification to assist producers to meet accepted criteria for food safety, sustainable production methods, worker and animal welfare and responsible use of water, compound feed and plant propagation. Green food in China is an eco-labelling of food that certifies the production process and the outcome. The Unilever code applies to all their suppliers including farmers and their practices relating to soil management crop and animal husbandry, working conditions and wider activities such as aspects of biodiversity and water.

These standards all include and measure the accepted legislative requirements as a minimum but also go beyond in some cases to include continuous improvement measures. In choosing indicators in this project all cross-compliance and legislated farm activity are excluded. The focus is on areas where we have no existing data and prioritising areas based on policy needs.

2.2.5 Gaps in existing evaluation instruments

There is currently an imbalance in the type of data that FADN requires Member States to collect, with a much greater focus on economic data than on environmental or social data (see Table 5). Many economic indicators can be assessed due to available accountancy data, while indicators relating to themes such as product marketing or non-agricultural income require data that are less commonly recorded. However, it should be said that the overarching objective of the FADN to date has been to collect data on outputs, inputs and incomes in farming.

Bockstaller *et al*. (2007) identified a gap in indicator development with regard to water quality. According to the authors, few French indicators are calculated on the watershed (catchment) scale, which is however a relevant scale for assessing surface water quality. Internationally, water quality has been a core issue for catchment scale research.

In general there is a huge gap in terms of social indicators, with relatively little information being collected. Social themes are clearly difficult to assess without collecting additional data on the farm. In fact, social indicators often depend on qualitative estimations. These indicators could also be classified as subjective in nature as they are often self-reported relating to an individual in a context at a point in time.

Table 5: Typology of policy topics relevant to farm-scale sustainability

Topic	Sub-topic	Assessment of the degree to which FADN data address the sub-topics
market stabilisation	risk management profitability Structure	* *** ***
income support	Social employment non-agricultural income income equity	* ** * ***
Environment	biodiversity Soil Water nutrients air	 * *
climate change	mitigation adaptation	
Innovation	process innovation organisational forms innovation product innovation market innovation supply source innovation	
resource efficiency	agronomic economic	** ***
animal welfare	animal health housing and shelter	

Note: asterisks denote the level of coverage of topic: * indicates low coverage, ** medium, and *** high coverage.
Source: the authors

The new Greening measures form part of Pillar 1 of the CAP 2014-2020. This Green Direct payment will account for 30% of the national direct payment envelope and will reward farmers for complying with three agricultural practices:

(i) maintenance of permanent grassland
(ii) ecological focus areas
(iii) crop diversification

If these Greening actions are to be effectively evaluated, they will challenge existing data collection exercises. In practice, farm records should provide output indicators to measure implementation (and effectiveness) of these policy initiatives. An important aim would be to disaggregate the greening measures on the farm as much as possible. What is also of interest is the environmental state of the land area to which the greening measure is being applied (e.g. species-rich grassland or intensively managed pasture, instead of permanent grassland), which provides important insight into the degree of targeting and likely output of environmental public goods. Such indicators will be more difficult to measure, and may be best addressed by other approaches than through the existing FADN. Farm-level indicators that project partners felt would be relevant to greening include:

- area of permanent grassland
- land use type under permanent grassland (e.g. protected area for wildlife, species-rich grassland, permanent grassland with intensive land use, etc.)
- levels of organic matter in soil in permanent grassland
- area under ecological focus area
- land use type under ecological focus area (e.g. set-aside, natural wildlife habitat, etc.)
- number of crops sown
- changes in cropping activities (crop diversification or rotation)
- levels of organic matter in soil in areas undergoing crop diversification
- eligibility for greening equivalence

2.3 C. Individual Indicators

A wide range of indicators of farm-level sustainability measurement was developed as a starting point for the project. This exercise resulted in the identification of over five hundred individual indicators by the FLINT project partners. This was reduced to just over two hundred indicators on the basis of a range of criteria such as: removal of duplicated indicators, removal of indicators that represented cross-compliance and removal of indicators where other data sources (other than FADN) were available. The remaining indicators were retained if they were feasible at farm-scale and reasonably achievable with given resources.

The indicator collection process is described here in brief. The first step in the process categorised the indicators into those that are 'new to FADN' or 'existing in FADN'. The focus was on new to FADN and this list was sub-categorised into the six FLINT topic areas for farm-scale sustainability. The next phase included the data requirements for each of these topic areas, a suggested list of variables was discussed (See Table 6). Based on these discussions with partners and the input of the advisory board, a condensed list of indicators was outlined (section 2.4). The next stage of the process involved the selection of partners chosen as indicator owners (IO's) because of their relevant expertise with the broad indicator topic. It was the responsibility of the IO's to return the template (Table 6) to lead partners and to incorporate the feedback from all other partners. This resulted in the identification of a clear description of relevance of the topic, a short description of the information requirements and an example of how this topic addresses relevant policy topics. This provides a clear reason why topics are chosen and what is being collected.

2.3.1 Indicator selection

Indicators may be either simple or complex. Simple indicators are based on one or a simple combination of variables of the same dimension. Complex indicators require more data, in particular environmental indicators. Simple indicators may be aggregated using knowledge on processes to generate proxy emissions or state indicators, which can be related to performance. In any case, information should be provided on the scientific soundness (e.g. predictive quality), feasibility and utility of candidate indicators. More precise criteria can be found in Niemeijer and de Groot (2008a) and Bockstaller *et al*. (2009a). During the indicator selection process much consideration was given to the quality of data. Stakeholders and partners were given the opportunity to evaluate indicators on the basis of feasibility to generate reliable data and useability as an indicator of sustainability.

The list of agreed topics for sustainability measurement and the list of suggested variables (Table 6) are based on a comprehensive literature review, national initiatives and the policy priorities as described. This list and the associated suggested variables were also discussed in small expert groups, and gave an opportunity for partners with expertise in the area to discuss various issues with the suggestions made or to identify remaining gaps.

2.3.2 Indicator Wish List

Table 6: Indicator Wish List

REF	Innovation/RDP1	Suggested Variables
1	Technology adoption: for farm level improvements in output (e.g. generic/suites of technology, ICT)	Yes/ No Years of consistent use
2	Training, education-HH, lifelong learning, vocational training & advisory services	Yes/No Details of grants/subsidies received Changes implemented as a result Currently measured using three levels (more detailed list)
3	Implementation of product, process, organisational or marketing innovations	Yes/No Details of activity (external/internal) Using established survey (CIS) Identify short supply chain: processing on farm/ Co-operative Share(€) of production in short supply chain
	Market stabilisation & income support/RDP2	
4	Producing under a brand/label (PDO/PGI) Also possibly include organic label?	Share of production (EU FADN 2014 Y/N)
5	Types of Market outlet (Direct sales/contract production/other)	Share of production to each supply chain Regulation to facilitating/hampering sales
6	Past/Future duration in farming (Survival propensity)	Year farm first set up Years farming as main decision maker Presence of successor (function of age)
7	Efficiency field parcel (LPIS)	Number & size of all plots; average distance from plots to farm
8	Modernisation of farm focused on farm capital investment	Categories of investment over a longer period of time
	Market stabilisation & innovation/RDP3	
9	Insurance (events outside control of farm) Also to include personal (disability) & farm (building structure) insurance	Area covered (%) & number of contracts Yes/No Focus on area or Y/N
10	Share of output under contract with fixed price Delivery contracts	Volume & value of contract
11	Risk exposure (non-agricultural activities)	Share of (indirect) total farm income Share of off-farm revenue in household revenue Occupation (farmer & others in HH)
	Environment/RDP4	
12	Greening: permanent grassland	Area; extensively-managed (<50 kg N) permanent grassland dominated by natural vegetation (*requires definition*)
13	Semi-natural farmland areas	Area (or equivalent) with ecological infrastructures or fixed landscape elements and permanent grassland (<50 kg/ha/year nitrogen) (*incorporate linear features - LPIS*)

14	Natura 2000 (HNV)	Area of farm designated as Natura 2000 (*area via N2K info, LPIS*)
15	National designation	Area of designated for wildlife/landscape (not Natura 2000)
16	Greening: Existing/created areas of EFA	Area of existing/created EFA: habitat type
17	Water usage and source (see also irrigation)	Farm water: (volume) and cost (€) Domestic water: (volume) and cost (€) Capacity (volume) for storage of water Tap water, rainwater collection, farm well, other (*pump capacity and hours of usage- irrigation; permit required*)
18	Pesticide risk score (index)	Amount (kg/ha) per pesticide per farm per year * potential impact of active ingredients (*needs specification, but current method available*)
19	Nutrient balance (N, P) (farm-gate balance)	Multiple variables to be recorded* *Display the input variables – not just final surplus value*
20	Conservation tillage for soil erosion Conservation tillage for nitrogen/water	Arable area with minimum tillage Area green cover in winter/catch crop
21	Soil organic matter in arable land *(from RDP impact indicator)*	Total SOC in top 30 cm of the topsoil in arable soils (Mt) (but need to clarify the method)
22	Soil nutrient sampling conducted	Yes/no
23	Soil erosion	Area at risk of soil erosion (vulnerable areas) Type of erosion management/control strategies (*linked with LPIS? Technical specification?)*
24	Use of legumes in crop rotations	Area of farm sown with legumes, and type of legume (forage vs protein crop)
25	Disaggregation of environmental payments	AE schemes/greening/re-designation of ANCs *(Available in IACS?)*
	Environment, change adaptation and mitigation and resource efficiency RDP 5	
26	Irrigation practices	Water volume used (irrigation) area of application, equipment type
27	Direct Energy usage	Quantities of fuel, gas, electricity, wood purchased Investment in energy-efficient technology (*list, and differs among countries)*
28	On-farm RE production	Energy crops, wind, water, solar, wood biomass, anaerobic digestion
29	GHG emissions per product	Carbon equivalent per unit of product *(multiple variables requiring info on nitrous oxide and CO2 impacts of farm inputs, disaggregated by product)* (mixed farming = more demanding...)
30	GHG emissions per ha	Carbon equivalent per ha *(multiple variables)*
31	C-sequestering land uses	Area of wooded or afforested areas Area under agroforestry Permanent grassland *(existing variables - check)*
32	New ideas	Soil compaction; crop rotation; crop diversity (makes more sense if more detail about crops e.g. legumes); field size (in LPIS)

	Social/RDP6	
33	Ownership/ management	Farm ownership/management: sole, jointly with spouse, jointly with family members, management board Full-time/part-time Gender of above Contribution of above to overall workload (share of workload) Off-farm income (yes/no) Level of agricultural (technical) or management training undertaken by members
34	Education	Level of agricultural (technical) or management training undertaken by farm family members (by gender)
35	Planning and decision making	How do you make major strategic farm decisions? (alone, with spouse, with family, with management board ....) Who do you get professional advice from? (no-one, bank, advisory /extension professionals, input suppliers,.... In terms of major decisions with regard to the future of your farm, how much in control do you feel?
36	Employment/ Health and well-being	How satisfied are you with your Quality of Life? (rate) Number of days holidays per farm manager (farm worker) Average working day of farm manager (workers) Weekends worked (%) by farm manager (workers) Has there been an accident on your farm in the last year? If yes, how many work days were lost? Do you avail of replacement farm workers?
37	Social engagement/ participation	a) Membership of farmers' association / professional organisation? b) Membership in civil /voluntary/associations: (village renewal, religious, sporting, nature conservation, living in the area, other) c) Member of local / territorial/municipality/ government? d) Participation in: (LEADER project/ local action groups (LAG) or integrated rural development/ or OG (EIP)?
38	Social diversification: improving the image of farmers/agriculture in local communities	External activities/ "Jointness": On-farm sales, direct selling, farmers markets, fairs/exhibitions, giving apprenticeships, open day events, participation in nature conservation, quality certification programs/covenants.
	Other indicators (not covered RDP policy)	
39	Animal Welfare	Do you undertake voluntary animal welfare actions above and beyond the regulations? Do you participate in an animal welfare charter/covenant? Animal housing standards
40	Agri-tourism	Farm income generated from tourism Proportion of farm labour dedicated to agri-tourism Investment in agri-tourism

2.4 Indicator Outline

Further discussion focused on narrowing the wish list (Table 6) to refine the list of indicators. Indicators: 14, 15, 25, 32, 39 were deemed either not "need to know" or the information would be available through other sources such as IACS. The remaining indicators were left as initially defined, or merged in some cases. The indicators were then renamed (See 2.4) and grouped into Social (7), Economic/Innovative (9) and Environmental indicators (17). The indicators were then assigned to IO's based on their areas of expertise and their expressions of interest. Each IO was asked to provide a high level description of the indicator, the type of information required and an example of how the indicator addresses an area of policy. This resulted in a total of 33 FLINT indicators (section 2.4). The submissions received from the indicator owners formed the basis of the next phase of collaboration with stakeholders across the value chain (WP 2).

A more comprehensive discussion and presentation of these indicators is provided in Section 4. Appendix A.

2.4.1 SOCIAL SUSTAINABILITY

Farm Level Social Sustainability Indicators
S1: Advisory service provided to the farm
S2: Education and training
S3: Ownership/management
S4: Social engagement/participation
S5: Employment and working conditions
S6: Quality of life/Decision Making
S7: Social diversification: improving the image of farmers/agriculture in local communities

2.4.2 ECONOMIC/INNOVATIVE INDICATORS

Farm Level Economic/Innovative Sustainability Indicators
EI 1: Innovation
EI 2: Producing under a label or brand

EI 3: Types of market outlet
EI 4: Past/Future duration in farming (Survival propensity)
EI 5: Efficiency field parcel (LPIS)
EI 6: Modernisation of the farm Investment
EI 7: Insurance (events outside control of farm) Also to include personal (disability) & farm (building structure) insurance
EI 8: Share of output under contract with fixed price Delivery contracts
EI 9: Risk exposure (non-agricultural activities)

2.4.3 ENVIRONMENTAL SUSTAINABILITY INDICATORS

Farm Level Environmental Sustainability Indicators
E1: Greening: Permanent grassland
E2: Greening: Existing/created areas of EFA
E3: Semi-natural farmland areas
E4: Pesticide usage (Pesticide risk score)
E5: Nutrient balance (N, P) (farm-gate balance)
E6: Soil organic matter in arable land
E7: Indirect energy usage
E8: Direct energy usage
E9: On-farm RE production
E10:Farm management to reduce nitrate leaching
E11: Farm management to reduce soil erosion

E12: Use of Legumes
E13: GHG Emissions per product
E14: GHG Emissions per ha
E15: Carbon Sequestration (In FADN?)
E 16: Water usage and storage
E 17: Irrigation practices

3 INDICATOR OWNERS

3.1 What and Why

To complete the process of topic selection and indicator identification, the rationale for using individual indicators was clarified by the indicator owners. IO's were asked to provide the information as per Table 7. The rationale for this approach is based in the need for clear guidelines for all partners to be used as a guide for the stakeholder engagement process in all countries.

The text in sections 3.1.1, 3.1.2 and 3.1.3 summarises the comments returned by the IO's on environmental, social, and economic themes, respectively.

Table 7: Template for return of comments by Indicator Owner

[INSERT INDICATOR NAME]
1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.
2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).
3. Provide an example of how this addresses a policy issue, or could be interpreted.

3.1.1 Environmental: priority topics and proposed data required

Greening accounts for 30% of total CAP Pillar 1 expenditure currently. It is important to improve understanding of the implementation of the permanent grassland measure, especially for future policy formulation. It is also important to assess the extent to which the permanent grassland measure also contributes towards the objective of improving conservation of biodiversity. Secondly, greening relates to Ecological Focus Areas and there is a need to improve understanding of the implementation of the new EFA measure, especially for future policy formulation. Furthermore it is important to assess the extent to which the EFA measure also contributes towards the objective of improving conservation of biodiversity. A further aim of the CAP is to increase the area under wildlife habitats and protect biodiversity on farmlands. This project recognises these objectives and aims to capture temporal trends for improved targeting of policy by measuring areas of semi-natural farmland across the EU.

The use of pesticides on arable farms has an important impact on our natural resources specifically the risk to water. The types and amounts of pesticides will be collected at farm level as a minimum. Where possible the slope and soil type will also be recorded to improve the pesticide risk score for all farms.

This has proven difficult in the past for data collectors in partner countries who have attempted to collect such data. It is now required for farmers to record this information and so it is anticipated that the feasibility of data collection has improved. Although this does not measure pesticide levels in water, it does indicate the pressure of pesticide use on farmland. The Sustainable Use Directive (Pesticides Directive) is likely to cause a change in the pattern of pesticide usage.

Another tool which can reflect agronomic efficiency as well as environmental pressure is a farm nutrient balance. The balance provides policy makers with detailed assessment of the environmental performance of individual farms in terms of their nutrient balance on a per hectare basis but also with regards to their efficiency in terms of nutrient use. As the balance is calculated using only factors under the control of the farmer, the indicator provides a reliable measure of this aspect of sustainability at farm level. The key to using this measure as an indicator will be the development of an efficient means of communication to farmers. The communication of this information is vital for two reasons – it's potential to identify farm cost and the environmental impact of farm activities (cost savings and potential pollution).

The Balance of Soil Organic Matter (BOMS) is calculable using existing FADN data and standardised coefficients. It is important for soil fertility and sequestering of carbon in the soil, which helps reduce Greenhouse Gases in the atmosphere and improves the environmental sustainability of farming practices. The calculation of the BOMS will provide information on plant production and the basic principle of good management in agriculture. The soil organic matter is a set of all organic compounds except for the non-decomposed parts by plants, the remains of animals and the living microorganisms. Organic matter and its transformations into humus compounds play a vital role in creating and maintaining soil fertility at a high level, i.e. physical, chemical and biological properties favourable for plant growth and yield. Land management practices and risk of erosion are further soil related indicators which play an important role in sustainable soil management. Practices such as use of reduced till, cover crops, use of legumes and identifying areas at risk of soil erosion give policy makers and improved insight into farm level practice for improved soil management.

The use of energy on farms is also a priority topic. Two aspects of energy are calculated - indirect energy and direct energy. Indirect energy is calculable using existing FADN data and standard coefficients. More details are required to calculate direct energy in terms of cost, the amount of energy used and days of use. It is required for all energy types. Energy efficiency technologies for a given type of direct energy use can also be calculated. Classifications or clustering of farms provide useful insight into the energy use of different farm types and sizes. This indicator is closely linked to GHG also. The third indicator relating to energy is the production of on-farm renewable energy. It is proposed to capture financial and production output from renewable energy. This again is related to GHG indicators but also demonstrates that being energy self-sufficient improves resilience in terms of security of supply. This information will also give an indication of the types of renewable energy in use across the EU.

The calculation of a Greenhouse Gas (GHG) emissions factor at farm level is a major issue for agriculture, as the agricultural sector is a major source of GHGs, and also offers several opportunities to improve mitigation and adaptation. There is a need for improved information on the production of greenhouse gases across different farming systems, and geographical areas, and there is an opportunity to learn and better transmit best practices to reduce GHG emissions. The proposed IPCC methodology will be calculated using a number of indicators outlined in particular direct and indirect energy use. The calculation of more accurate carbon budgeting with more detailed GHG conversion factors is to be explored where the data is available (for example the collection of live weight of animals is proposed to be calculated to improve current measure which only records financial records of imports and exports). The experience of partner countries has shown that financial estimates are accurate measures where records of live weight are not available and the national average weights are available. Further, a more detailed GHG emission factor which is possible to calculate at farm level is the carbon footprint per

product. Many food processors are interested in the carbon footprint associated with the farm enterprise that is involved in the production of their chosen product. Thus, a grain company may be interested in the carbon footprint associated with the production of 1 kg of grain, whereas a milk processor may be interested in the carbon footprint associated with the production of 1 litre of milk. For mixed farms, this presents a specific challenge to allocate farm inputs and outputs to different products. Another factor affecting emissions at farm level is the potential for forestry as a carbon-sequestering land use; this can be factored in using existing data.

Another important environmental issue is the use of water and irrigation practices. On average, 44 % of total water abstraction in Europe is used for agriculture. Agriculture can impact in different ways on the good chemical and good quantitative status of groundwater and surface waters. Water quality may be negatively affected by the presence of pesticide residues, nutrients from fertilisers, or sediments from soil erosion. The project aims to collect details of water use in relation to cost of water consumption, volume of water and the sources of water. Meters are to be used where available and estimates will be used thereafter. In terms of irrigation the most intensive irrigation agriculture can be an important contributor to groundwater pollution (fertilizers, pesticides) and eutrophication of surface waters. Over-exploitation of aquifers can degrade the quality of water. The amount of water used for irrigation depends on factors such as: climate, crop type, soil characteristics, water quality, cultivation practices. The area and type of system will be recorded but also the energy and how the system is managed.

3.1.2 Social: priority topics and proposed data required

Advisory service provision is an important component of the knowledge, information and innovation system in agricultural holdings. It is expected that those farms accessing advisory services are better informed, have more knowledge and therefore, may be more innovative. Data will be Collected related to the farmer, level of education and the advice and training received. Advisory services contribute to the dissemination of innovative agricultural practices to increase productivity and improve environmental performance. This information will help to track changes on how farmers get information and knowledge to make innovations over time and across systems. Education is intended to develop specific skills and competences to improve job productivity for farmers and their employees. Both factors describe agricultural labour and human capital. This information will be used to measure the state of capacity development for agricultural labour, establish casual relationships in sustainability achievements and make comparisons across sectors and countries. The structure and ownership of farms is also complementary to the knowledge and advisory services. Management and ownership information provide a basic yet important starting point in terms of farm level decision making. This indicator identifies the ownership structures within the farm, the factors influencing decision making. The effect on resilience of non-family or multiple enterprise structures are also explored. The farmers' perception of their quality of life is also assessed based on autonomy and job satisfaction. This is one of the main objectives of rural development policies. Perceptions are measured subjectively and can be influenced by cultural and individual factors beyond the farm level which is interesting in making comparisons across regions and systems as conditions vary.

Beyond the farm gate, farmers also make social contributions in terms of employment, participation in local events or clubs but also through engagement in diversified activities which bring people onto the farm. Such social sustainability indicators are important to capture as they give an insight into how farmers are connected to others outside the farm. Further the magnitude of the engagement/participation can be important as being for instance a member of a nature association or a board member of a nature association do not imply similar commitment. This magnitude could also be captured asking about the participation in activities organised by the association/organisation. The

social diversification indicator has benefits for both producers and consumers. Producers can obtain higher prices and better promote their specific farm products. Farmers can recognize consumer needs through farm sales and direct selling interactions. Positive effects accrue not only on the food quality-related aspects but also on the value of products. This builds relationships between producers and consumers which have an impact on the image and the viability of the farm, thus putting forward a new model of agriculture. Finally, in terms of employment and labour in Europe, agriculture involves around 25 million people and an estimated equivalent of 10 million full-time job equivalents. Agriculture as an occupation has special characteristics such as prevalence of family labour, part-time regular employment and seasonality. As a measure of the quality of life, the quantification of the quantity and quality of the jobs in the agricultural sector is one of the crucial dimensions in social sustainability. It is proposed to calculate working hours, but also to estimate peak season working conditions in terms of months and average working day during those peaks. Weekend working and availability of replacement workers is also collected which allows for the comparison of conditions across regions and systems. Such conditions also related closely to previous suggested data on perception of quality of life.

3.1.3 Economic/Innovative: priority topics and proposed data required

Economic data is covered comprehensively in the EU FADN however the proposed type of economic topics and data suggested in this section relates to various other aspects of agriculture which improve the economic performance of farms indirectly and in a more sustainable manner. The production of new or significantly improved products, processes, organisational methods, or marketing methods are ways in which farmers improve economic sustainability. The data will capture innovation which must be new to the farm, although it could have been originally developed by other farms / enterprises. Smart growth: developing an economy based on knowledge and innovation is one of the main objectives of the Europe 2020 strategy. These indicators allow for the monitoring of innovations in the agricultural sector and allow analysis of the driving forces of innovations and their impact on productivity etc. With improved products, marketing may also include production under a brand or label, further improving the economic sustainability of the farm. This gives farmers an opportunity to potentially stabilise their market outlets. Producing under a brand or a label may enable farms to be less affected by price variability (since production price for brands/labels may be less subject to world price shocks). The market outlet for farm products is also an economic issue, thus it is proposed to collect data on the farmers outlets for products and the share of product in each outlet under contract. Understanding who, in the farming population, decides to sign agreements with distributors and how such contracts impact on farm income and income volatility can help in understanding other aspects of risk management on the farm. This directly addresses the FLINT policy topic of market stabilisation and risk diversification in bringing a product to a new/alternative market.

Concerns around farm survival propensity and future duration of farms are an on-going issue for agriculture globally with an aging population and land mobility problems in many countries. The issue of inheritance is important for farm level decision making. Current decision making and future decision making is largely influenced by existing farm governance structures. Who influences or makes the final decision on the farm? It is expected the number of years' experience as the main farm decision maker also influences the decision. This is recorded as part of the new data collection. The presence or absence of an heir is also influential in identifying farmer's objectives and future intentions. The issue of farm succession directly relates to the core of sustainability focusing on future generations of farming. Given the intergenerational ties between families and farming tradition, farm succession is a key issue emerging for future policy. It may also be interesting to look at national governance structures which may facilitate/hinder transfer of the farm. This is an influential factor but one that is beyond the farm gate and so possibly outside the scope of this project.

The fragmentation of land parcels also presents challenges for farms. The aim is to use available Land Parcel Identification System (LPIS) data on all farms and to ask additional questions. The size of farms is growing rapidly and new field plots are rented or purchased by the farmers. Very often the distances from the farm to new field plots are increasing. Long distances will increase production costs and consumption of energy.

Modernisation of farms is crucial to improve their economic performance through better use of production factors including the introduction of new technologies and innovation. Modernization is viewed as a technological progress in order to reach and/or maintain sustainable development/growth. Productivity growth can be enhanced through two pathways: technological change (TC) and technical efficiency change (TEC). TC captures the improvement in best practice through adoption of new technologies resulting in more efficient farming systems (i.e. the best farms getting better). TEC captures improvements in TFP arising from 'slower moving' farms adopting currently available technologies and knowledge. It reflects the aggregate influence of 'average' farms catching up to the best-performing farms. The use of modern management tools and the age of farm machinery will be collected. The returns to investment may be more than purely financial or efficiency improvement as it could also represent a time saving return.

Risk is also assessed using two indicators - one is the presence of insurance and the type of insurance cover; the second relates to sales contracts as discussed earlier but also the type of contracts for example fixed price delivery contracts and or use of futures and options as risk mitigating strategies. The share of output under contract shows how much farmers rely on the "free" market and the risk of possible changes of prices. An indicator of risk exposure is examined exploring the non-agricultural related activities on the farm. These activities can have a substantial share in the total income of the farm. Insight into the income from non-agricultural activities can help farmers to benchmark with colleagues who also develop non-agricultural activities. Income stability is no longer certain in a liberalised agricultural market. Non-agricultural activities can help to stabilise farm income over time.

3.2 Summary

This document details the process involved in selecting the farm level indicators chosen to evaluate new EU policy topics as part of the FLINT project. A comprehensive literature review was undertaken by the partners followed by the suggestion of a wide range of candidate indicators. The list of candidate indicators was refined and reduced following a stakeholder process. A detailed description of each indicator and its relevance is presented in Section 4. These indicators will be tested for feasibility of collection in a pilot data collection network and will subsequently be tested for their usefulness for data analysis.

4 INDICATOR DETAILS

4.1 Environment

E1: Greening: Permanent grassland
1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.
The European Commission is now making about 30% of the direct payment conditional on Greening. One of the Greening measures relates to permanent grassland. This measure is considered important because of the ability of permanent grasslands to capture organic matter in the soil, which contributes to reducing losses of greenhouse gas from farmland.
2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).
1. What is the total area of permanent grassland identified on the farm for the Greening measure 'permanent grassland' (available from IACS). 2. What is the area of permanent grassland that is characterised by being more intensively used? i.e. meets the definition of permanent grassland, and is ploughed every 8-12 years, receives greater than 50kg nitrogen per annum, and is dominated by grass vegetation that has been sown for agronomic productivity 3. What is the area of permanent grassland that is characterised by being more extensively used? i.e. 4. Meets the definition of permanent grassland, and is dominated by natural or semi-natural vegetation. This would include rangelands and species-rich grasslands. The use of grassland management techniques, use of ICT in budgeting grass, measuring of mass herbage etc. many also be of interest as it may reflect more intensive users giving accurate measure of farm dry matter.
3. Provide an example of how this addresses a policy issue, or could be interpreted.
This information is important to: - Improve understanding of the implementation of the permanent grassland measure, especially for future policy formulation. - Assess the extent to which the permanent grassland measure also contributes toward the objective to improve conservation of biodiversity.

E2: Greening: Existing/created areas of EFA
1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.
The European Commission is now making about 30% of the direct payment conditional on Greening. One of the Greening measures relates to a new policy issue Ecological Focus Areas. This measure is considered important because of its intended contribution to increase the area and quality of habitat for protection of biodiversity on EU farmland. This is one of the aims of Greening. Some farms are exempt from this measure.
2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).
1. Is there an Ecological Focus Area on your farm? 2. If yes, what are the main habitat types contributing to EFA on your farm (choose from a list). 3. What area of EFA had to be created (e.g. by planting a crop, creating a habitat etc.?) 4. What area of EFA includes existing habitats?
3. Provide an example of how this addresses a policy issue, or could be interpreted.
This information is important to: - Improve understanding of the implementation of the new EFA measure, especially for future policy formulation. - Assess the extent to which the EFA measure also contributes toward the objective to improve conservation of biodiversity.

E3: Semi-natural farmland areas

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

The CAP aims to contribute to increase the area and quality of habitat for protection of biodiversity on EU farmland. One of the best indicators of biodiversity on farmland is the area (or percentage) of farmland occupied by wildlife habitats.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

1. Area (or equivalent) with ecological infrastructures (e.g. hedgerows, ditches, watercourses) or habitats (areas dominated by natural or semi-natural vegetation) including extensively managed species-rich grassland.

From a list of broad habitat types (river, woodland, deciduous plantation, conifer plantation, pond, lake, watercourse, species-rich grassland, marshland etc.) indicate which occur on a farm map.

3. **Provide an example of how this addresses a policy issue, or could be interpreted.**

Would allow a comparison of habitat area across regions and farming systems, and facilitate temporal trends. This would facilitate more targeted policy toward protection of farmland habitats.

E4: Pesticide usage (Pesticide risk score)
1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.
The recent legislative changes to the use of pesticides is likely to cause a change in the pattern of pesticide usage, and this information can help identify farmers' responses to this new situation, in terms of product type, volume of usage and costs. Pesticides can have an important impact on water quality, and can affect water quality for human consumption, livestock consumption and for aquatic habitats and wildlife.
2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).
Amounts and types (brand names) of different types of pesticides used on the farm. This should include pesticide use by contractors working on the farm. Use of precision agriculture tools GPS guidance systems, sensors etc. Obligatory: crop to which the pesticide is applied, area [ha] that is sprayed (to calculate a farm-level index, area-weighted aggregation) (Optional: soil type (texture: clay loam, silt loam etc., depth: shallow or deep, organic matter: <1.5%, 1.5-5%, >5%), average field slope on the farm, % drained area)
3. Provide an example of how this addresses a policy issue, or could be interpreted.
With this information, researchers can calculate a farm-level pesticide risk score. Pesticides in water are an impact indicator for DG Agri. Although this does not measure pesticide levels in water, it does indicate the pressure of pesticide use on farmland. The Sustainable Use Directive (Pesticides Directive) is likely to cause a change in the pattern of pesticide usage.

E5: Nutrient balance (N, P) (farm-gate balance)

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

The identification of a farm gate nutrient balance is a positive step for farms.

Greater awareness of nutrient usage can help identify opportunities to save on fertiliser costs, reduce greenhouse gas emissions, and improve environmental sustainability. This can be achieved with no impact on production, representing a win-win scenario. It can reflect agronomic efficiency as well as environmental pressure.

Unsustainable fertilizer management has an adverse impact on the profitability of production, and it also poses a serious threat to the health of humans and animals. Over-fertilisation leads to economic losses that result from higher costs incurred to acquire the industrial forms of production and to lower crop yields, both in terms of weight and in terms of quality. Unfortunately, too low fertilisation – a deficit of even one nutrient – contributes to the under-utilisation of soil productivity and production capacity of plants, and therefore lower yields. Nutrient deficiency also leads to a reduction in soil fertility, and sometimes even to its degradation. Renewal of the reserves of phosphorus and potassium on heavily depleted soils is very costly and lengthy (gradual and increased fertilisation for about 10-15 years is necessary).

The basis for determining the optimal dosage of fertilizers is formed by the balance of the primary nutrients, i.e. nitrogen, phosphorus and potassium. The balance of the ingredients can be prepared by different methods and at different levels, for example at the level of field, farm, region, country. Theoretically, it is recommended to draw up the balance of a farm on an annual basis, but in practice the preparation of a balance every 5 years is considered a good agricultural practice. A balance provides valuable information about the correctness of fertilisation and allows for proper planning of the fertilizer economy – and hence it is an important agri-environment indicator that demonstrates the correctness of the management of mineral components.

The preparation of a specific nutrient balance provides farm level information to the farmer potentially represents a dual benefit to the farm; firstly it potentially represents a cost saving but also may be a requirement from industry in the future. The environmental footprint of the farm is salient considering the significant contribution of the sector to greenhouse gas emissions. The farm gate approach focuses on imports and exports over which the farmers have direct control (Buckley et al. *Under Review*).

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

The suggested indicator could be measured using a variety of mechanisms. This section provides two indicators: N/P balance per hectare and N/P use efficiencies.

Other potential measures include UK measures see the Department of Agriculture and Rural Development (DARD): http://eservices.ruralni.gov.uk/onlineservices/FarmNutrient/index.asp

a. Nitrogen manure livestock loading calculator: Estimates Livestock Manure Nitrogen loading based on the total land area farmed and Nitrogen produced from livestock and/or imports/exports of

slurry/manure.

b. N max for grassland calculator:
c. Crop nutrient recommendation calculator: Calculate the amount of nutrients, nitrogen (N), Phosphate (P_2O_5) and potash (K_2O) required by crops as recommended by DEFRA Fertiliser Recommendations for Agricultural and Horticultural Crops (RB209). Calculate the amount of nutrients, nitrogen (N), Phosphate (P_2O_5) and potash (K_2O) supplied by organic manures and chemical fertilisers. Ensure nutrients are not oversupplied or undersupplied to crop requirement. Comply with the nutrient limits for the Nitrates Action Program (NAP). Complete records for NAP with regard to nutrient limits. You will be required to enter data on field, soil, crop and fertilisers.
d. Phosphorus balance calculator:
e. Slurry and Manure storage calculator: Calculate your estimated weekly slurry, dirty water and manure production, current storage capacity and additional storage capacity required to comply with the Nitrates Directive Action Programme measures

To take this further an eco-efficiency indicator on a per kg of product basis – milk/meat produced per kg of N/P surplus etc. could also be calculated. Farm level micro data is required in identifying all farm inputs and outputs (N&P) and calculations assume all purchases are used in the year.

The following indicators are calculated using the above listed variables.

1. N/P balance per hectare
    - When calculation are finalised for each farm the total quantities of N or P kg ha $^{-1}$ imported from quantities exported-kg ha $^{-1}$. According to Buckley et al. (*Under Review*) this is an indicator of environmental pressure
2. N/P use efficiencies
    - Nutrient use efficiency is calculated by dividing total kg of N or P exported as a percentage of total kgs imported. This is an indicator of agronomic efficiency of nutrient use across all systems (Buckley et al. *Under Review*).

Imports

- Chemical fertilisers: Composition (N, P&K) and quantities of chemical purchased, kg's of N&P direct calculation.
- Concentrates: Quantity of concentrates purchased the conversion of N & P calculated using standard values (Ewing, 2002).
- Forage feeds: Quantity of feeds purchased tonnes of silage/straw/cereals/root crops for example. For each forage crop the quantities are converted into kg's of N&P using standard values (Ewing, 2002). The calculation was based on forage feeds fed to animals, accounting for closing stock but also including forage feed grown and fed to animals during the year.
- Livestock: Where possible live weight of animals purchased using standard coefficients to kg's of live weight purchased (ARC, 1994). When live weight is not available this could be estimated based on purchase price dividing by prevailing price (cent/kg) for type and age of animal.
- Other imports: Milk replacer (substitutes for raw milk fed to calves) quantities converted into kg of N&P using standard values (Tikofsky et al. 2001).

Exports

- Milk: Litres of milk sold and KG of milk solids (protein and butterfat). The associated N export is calculated using standard coefficients (DePeters and FerGuson, 1992) to kg of milk

protein sold. P exported in milk sales was also calculated using standard values for P content.

- Livestock: Where possible live weight at point of sale, carcass weight can also be used which is converted to live weight and standard coefficients are then applied to calculate KG of N&P exported.
- Crops: Yields on cereals/crops grown captured in sales/fed or included in closing inventory all treated as export again estimated using quantities of each crop using their respective standard co-efficient (Ewing, 2002)
- Wool: Quantities of wool sold in KG sales are calculated using quantities in sales and a co-efficient (Jarvis et al., 2002).

Buckley, C., Murphy, P. N.C., Wall, D.P. and Moran, B. *Under Review*. Using the EU Farm Accountancy Data Network to develop environmental sustainability indicators in the use of nitrogen and phosphorus at farm level.

DePeters, E.J. and Ferguson, J.D., 1992. Non-protein Nitrogen and Protein Distribution in the Milk of Cows. Journal of Dairy Science, 75, 3192-3209.

Ewing, W. N., 2002. The Feeds Directory: Commodity Products Guide, Context Publications.

Jarvis, P.J., Boswell, C.C., Metherell, A.K., Davison, R.M. and Murphy, J.A., 2002. A nutrient budget for the Meat and Wool Economic Service of a New Zealand Class 1 high-country farm model. New Zealand Journal of Agricultural Research, 45, 1-15.

Tikofsky, J. N., Van Amburgh, M. E. and Ross, D.A., 2001. Effect of varying carbohydrate and fat content of milk replacer on body composition of Holstein bull calves. Journal of Animal Science, 79, 2260-2267.

An alternative measure is that which is recommended by the OECD *farm surface balance – gross nutrient balance*. This method is used by Central Statistical Offices in European countries to calculate National Nitrogen Balance for the needs of EUROSTAT. (No further variables are required to calculate beyond what is already in existence as it is based on standard coefficients).

The difference is, that in this OECD methodology, all sources of nutrients are taken into consideration (mainly: N in precipitations and leaking NH_3 and de-nitrification NO, N_2O) – so in the effect we receive real information about amount of nutrients that are accumulated in the soil and potentially can generate threat to the natural environment.

3. Provide an example of how this addresses a policy issue, or could be interpreted.

This provides policy makers with detailed assessment of the environmental performance of individual farms in terms of their nutrient balance on a per hectare basis but also their efficiency in terms of nutrient use. As indicators these provide reliable measures of sustainability at farm level. The key of this as an indicator will be the development of an efficient means of communication to farmers. The communication of this information is vital for two reasons it's potential to identify farm cost and environmental impact of farm activities (cost savings, potential pollution tax excessive use).

E6: Soil organic matter in arable land

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

On arable land, soil organic matter is important for soil fertility. It is also important for sequestering of carbon in the soil, which helps reduce Greenhouse Gases in the atmosphere and improves the environmental sustainability of farming practice.

Proper crop rotation and fertilisation of plants should provide a positive **balance of organic matter in the soil**. Balance of soil organic matter is considered an important ecological indicator, an important element of assessment of the organisation and plant production and the basic principle of good management in agriculture. The soil organic matter is a set of all organic compounds except for the non-decomposed parts by plants, the remains of animal and the living microorganisms. Organic matter and its transformations into humus compounds play a vital role in creating and maintaining soil fertility at a high level, i.e. physical, chemical and biological properties favourable for plant growth and yield. The content of humus in the soil[2] results in good quality and high level of achieved crops. The balance of organic matter reflects the soil quality level, which is in part a result of human activity, which is conscious or results from lack of knowledge and concern about the quality of the basic agricultural production factor.

On the basis of Wrzaszcz 2014, some of the details connected with SOM balance are included in the indicator table. The balance of soil organic matter is drawn up only for arable land since the balance result under a permanent plant cover in grasslands always takes positive values. The positive balance of organic matter is an indication of a good crop rotation, systematic enrichment of the soil with humus and a gradual decomposition of organic matter in the soil, ensuring proper supply of nutrients for the crops throughout the entire growing season. Accumulation (reproduction) of organic matter takes place under multi-annual field crops such as legumes and their mixtures with grasses, in particular on permanent grassland. The processes of decomposition (degradation) occur in root plants, fodder and grain maize, and to a lesser extent in cereal crops. Changing permanent grassland into arable land results in rapid decomposition and loss of organic matter content. The negative balance of organic matter indicates the need to change the farming method. If lasting for several years, a negative balance can cause soil degradation, loss of soil fertility and productivity. Another negative effect of degradation is the release of large amounts of minerals, including nitrogen, which leads to contamination of groundwater and surface water.

The method of calculating the balance of organic matter that is used by the Institute of Soil Science and Plant Cultivation – National Research Institute has been adapted to the available statistics, adopting the assumptions for the production of livestock manure and the production and distribution of organic fertilizers (straw) in the surveyed entities (Formula 1) 3. The balance result should not take negative values.

[2] Humus, i.e. relatively stable, amorphous, dark products of processing of plant and animal input in the soil and their various combinations with mineral components of the soil mass. Humus may represent as much as 90% of the total content of organic matter in the soil. As a result of mineralisation, 2-4% of organic matter in the soil is lost per year (source: http://slownik.ekologia.pl/).

[3] The method of determining the balance of organic matter on the basis of FADN data is shown in the publication: W. Wrzaszcz, *Bilans glebowej substancji organicznej w gospodarstwach indywidualnych objętych rachunkowością rolną FADN*, [in:] *Oddziaływanie rolnictwa na środowisko przyrodnicze w warunkach zmian klimatu*, Studia i Raporty IUNG-PIB, No. 19, Puławy 2010, p. 69-89. It was prepared on the basis of the following publications: A. Harasim, *Przewodnik…, op.cit.,* p. 67-69, 80; J. Kuś, A. Madej, J. Kopiński, *Bilans słomy w ujęciu regionalnym*, [in:] *Regionalne zróżnicowanie produkcji rolniczej w Polsce*, Studia i Raporty IUNG-PIB, No. 3, Puławy 2006, p. 212-216; *Poradnik…, op.cit.,* p. 49.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

There are two main approaches to acquire information:

1. Information on farm practices that enhance soil organic matter, and
2. Measurement of soil organic matter in soil samples.

1. Information on farm practices that enhance soil organic matter, and

- Soil sampling (frequency/timing)

- Use of nutrient management plan (software)

- Incorporation of crop stubbles

- ploughing frequency

2. Measurement of soil organic matter in soil samples.

Soil test that will measure soil organic matter (30cm depth, but need to consider compatibility of soil test with related EU projects).

Formula 1. Balance of soil organic matter

$$BOMS = \frac{\sum_{i=1}^{n}(x_i \times r_i) + (y \times r_1) + (z \times r_2)}{\sum_{i=1}^{n} x_i}$$

where:

BOMS	–	balance of organic matter in the soil (t/ha),
xi	–	cultivated area of individual plant groups (in hectares); i = 1, 2, 3, … , n,
y	–	amount of natural fertilizers – manure (in tons),
z	–	amount of organic fertilizers – straw (in tons),
ri	–	reproduction rate or degradation rate for organic matter for plant groups (in tons),
r1	–	reproduction rate for natural fertilizers (in tons),
r2	–	reproduction rate for organic fertilizers (in tons).

3. Provide an example of how this addresses a policy issue, or could be interpreted.

This is an impact indicator for DG Agri

E7: Indirect energy usage
1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.
This would largely reflect the energy impact and contribution to Greenhouse Gas emissions from farming activities. Note that these data can be calculated from current FADN data. Amounts of feed and nitrogen fertiliser purchased can be multiplied by a weighted average N2O and CO2 emission factor. Should be expressed in equivalent CO2/unit of production. Thus, there is no urgent need to ask farmers questions about this.
2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).
Note that these data can be calculated from current FADN data. **NO NEW DATA COLLECTION NECESSARY FOR THIS INDICATOR**
3. Provide an example of how this addresses a policy issue, or could be interpreted.
Important for policies related to energy efficiency and climate mitigation.

E8: Direct energy usage

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

Direct energy use is a substantial cost for the farm enterprise and contributes to greenhouse gas emissions. Understanding these factors can help to develop devices that use energy produced in a more sustainable way ("green economy" and GHG issues). Understanding the details of direct energy use can contribute to better design of relevant interventions (e.g. RDP).

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

Proposed data to be collected:

	amount of energy	number of days in use	cost
Energy used for heating in agriculture production			
of which is based on natural gas			
of which is based on electricity etc.			
Energy used for cooling/ventilation in agriculture production			
of which is related to fan			
of which is related to cooling house			
etc.			
Energy used for lighting in agriculture product			
of which is related to LED			
of which is related to compact fluorescent lamp			
etc.			
Fuel consumption of specific operation			
of which is related to harvesting			
of which is related to spraying			
etc.			
Energy used for irrigation in agriculture production			
of which is related to sprinkling			
of which is related to drip irrigation			
etc.			
Energy used for drying in agriculture production			
of which is based on natural gas			
of which is based on biomass			
etc.			
Other direct energy use			
TOTAL DIRECT ENERGY USE		-	

3. **Provide an example of how this addresses a policy issue, or could be interpreted.**

   Based on the above described data, energy efficiency of different technologies for a given type of direct energy use can be calculated. Given the fact that cost figures at the same detail will be available, economic assessment can be completed in meaningful manner. Already existing classifications or clustering of farms provide useful insight of the energy use of different farm types and sizes. This indicator is closely linked to GHG.

E9: On-farm production of Renewable Energy (RE)

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

Energy use is a substantial cost for the farm enterprise and contributes to greenhouse gas emissions. Use of renewable energy can reduce costs and improve environmental sustainability, although there can be substantial capital investment required.

RE production might address multiple issues in the focus of the CAP. Depending on the type of RE (wind, solar, biomass) and the technology used (photovoltaic vs. thermal; biofuel vs. biogas) the overall contribution mix (GHG mitigation, biodiversity, labour, investment need) will be different. RE has significant spill over or multiplier effect as well, that is currently not documented in detail.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

1. Financial figures of RE production per technology (wind, solar, biomass, geothermal)
    a. capital investment
    b. amount sold
    c. price per unit sold
2. Production figures of RE per technology (wind, solar, biomass, geothermal)
    a. Joules/production unit tons, kWatt
    b. number of productive days

amount of RE used on-farm

3. Provide an example of how this addresses a policy issue, or could be interpreted.

RE production is an important part of the farm GHG footprint.

RE can contribute to additional direct and indirect labour use.

Energy self-sufficiency improves resilience of energy supply and energy security.

E10:Farm management to reduce nitrate leaching

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

The careful matching of crop requirements to application of fertiliser and nutrients is a cost-effective and environmentally beneficial management practice. Prevention of nitrate leaching often means that available nutrients are not wasted, and can result in reducing costs of fertilisers without a loss in production.

In addition prevention of nitrate leaching is an important aim of the Nitrates Directive, which is aimed at protecting water quality.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

-The area of arable fields

- The types of farm management practiced on each field in terms of the following categories: catch crop, alfafa, temporary grassland; = 0.25 if winter rapeseed, = 0.75 if other winter crop : = 1 if spring crop;

$\Sigma a_i * c$

where a_i: area of field I;

c = 0 if catch crop, alfafa, temporary grassland; = 0.25 if winter rapeseed, = 0.75 if other winter crop : = 1 if spring crop;

Farm equipment concerning natural fertilizers and waste

Approximately what % of slurry and/or manure on your farm was spread during the following seasons? Spring/ Summer/Autumn/Winter

In the last 5 years have you had a laboratory test to establish the N or P content of your farm slurry and/or manure?

Which of the following slurry spreading methods are used on your farm?	1 Vacuum tanker with splash plate
	2 Band spreader system
	3 Trailing shoe system
	4 Injection system
	5 Dung spreader
	6 Other _____

Before spreading do you usually estimate the N or P content of your slurry and/or manure?

Do you keep records of chemical/organic fertiliser applications for individual fields?

Use of precision agriculture tools for fertilizer and pesticide use GPS etc.

Questions re nutrient management.
See Wrzaszcz, W. (2014) Sustainability of Agricultural Holdings in Poland. Studies and Monographs, No 161, IERiGZ-PIB, Warsaw, Poland, pp.231-233. *Survey (directed to FADN farmers) such questions connected with nutrient management were included:*

1. Do you respect the recommendations from the packaging when applying mineral fertilizers and when determining the dosage? 1. Yes 2. No

2. Do you have a nitrogen balance drawn up for your farm? 1. Yes 2. No
2A. [If so] How often is it drawn up? Every..... year/years

3. Do you have a fertilising plan drawn up on the basis of up-to-date results of soil analysis?
1. Yes 2. No

4. How often do you use calcium fertilizers and how large is the covered area? [Please, underline or write the answer]
(a) 1. Every year 2. Every two years 3. Every ……. years
(b) I apply fertilizers: 1. within total utilised agricultural area
2. some of the utilised agricultural area, i.e. ……%
(c) The recently used annual amount of calcium fertilizers within farmland
[Please, choose the fertilizers and quote the amount in decitonnes]
1. 75% CaO (calcium oxide fertilizers) …… (dt)
2. 50% CaO (calcium and magnesium fertilizers) …… (dt)
2. 40% CaO (carbonate fertilizers) …… (dt)
4. 30% CaO (dolovit) …… (dt)
5. Other …….. (dt)
[Please, quote the name, CaO content (%) and amount in dt]

5. Do you use natural fertilizers (e.g. livestock manure)? 1. Yes 2. No
5A. [If so] When do you use natural fertilizers? [Please indicate the months] from …… to ……
5B. [If so] Do you buy natural fertilizers? 1. Yes 2. No

6. Is your farm equipped with:
(a) tanks/separate utility room dedicated to the storage of farm waste (plant protection products, fertilizers, oil containers, etc.)? 1. Yes 2. No
(b) tanks for storage of domestic waste (household waste)? 1. Yes 2. No
(c) tanks/plates for the storage of livestock manure?
[If so, please indicate for how many months their capacity/size makes it possible to store it, otherwise indicate the place of storage]
1. Yes, I am able to store fertilizers for …….. months
2. No, I store livestock manure in/at …… (e.g. in a barn, in the field)
3. Not applicable

7. Do you practise ploughing under the straw in your farm? 1. Yes 2. No
7A. [If so, please quote the percentage of the area] What is the average area of the utilised arable land where you plough under the straw? on ……..% of the arable land

3. Provide an example of how this addresses a policy issue, or could be interpreted.

This indicator informs about farmers awareness of sustainable natural fertilizers and waste storage

E11: Farm management to reduce soil erosion

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

Soil is an important resource that sustains agricultural production. Soil erosion is a serious threat to soil resources. In addition, soil erosion has considerable further consequences for farm production, profitability, and environmental effects (e.g. knock-on effects water quality in watercourses).

The index of arable land vegetation cover in winter is considered one of the agri-ecological indicators designed for synthetic assessment of resources at the surface of agricultural land, the balance of ecosystems and the degree of implementation of sustainable production system in agriculture. Vegetation cover during the winter prevents negative impact of climatic factors on soil, such as rain and wind. Growing plants on arable land during the period between the two main crops reduces water pollution (it reduces the risk of nitrate leaching) and protects the soil from erosion. It is advisable for the cropped area of winter plants to be as large as possible. It is particularly dangerous to leave the soil without plant cover for a longer period because as a consequence of the destructive impact of rainfall, wind and sunlight, soil is subject to physical, chemical and biological degradation. According to the Polish experts, the following threshold values are considered sufficient levels of soil protection for the grown plants: 33%, 40%, 50%, and even 60%.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

- Share of arable area with reduced tillage
- Share of arable area with low soil cover during drainage period (winter)
- Area at risk soil erosion (vulnerable areas)
- Erosion management/control strategies

This ratio has been calculated as the relationship of the total area of specified below crops (1, 2, 3) and the sown area of arable land.

1. winter crops (i.e. wheat, rye, barley, triticale, cereal mixes, vetch, legume mixtures with other winter plants, rape and turniprape),
2. aftercrops on the arable land,
3. grass in the field cultivation for green fodder.

Crop	Soil cover factor
Winter oil seed rape	0,50
Winter wheat	0,90
Winter barley	0,85
Winter rye	0,80
Sown meadow, alfafa, clover	0,05
Spring crop without catchcrop before	1
Spring crop without catchcrop before	0,20

3. Provide an example of how this addresses a policy issue, or could be interpreted.

Σ $area_i$*c

where $area_i$: area of field i, c : = 1 if reduced tillage 0 if plough tillage

Sum of area per crop * soil cover factor during risk period/total farm UAA

soil cover factor during risk period = factor expressing low soil cover during drainage period (winter)
= 1 – soil cover factor

E12: Use of Legumes This is to collected in the new FADN return for arable , thus NO NEW DATA COLLECTION NECESSARY

Note: Grassland is not accounted for. This could be incorporated into the N Balance accounting for clover in swards of permanent grassland

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

Legumes are able to capture nitrogen from the atmosphere and provide 'free' nitrogen fertiliser.
This can help reduce the expenditure on nitrogen fertiliser and improves yields. It also contributes to improved soil fertility, and is important in crop rotations.
The reduced use of chemical N fertiliser reduces energy used to make fertiliser, reduces losses of nitrogen to water as nitrate leaching, reduces losses of nitrogen as greenhouse gases, and can improve carbon sequestration. This makes it a very cost-effective environmentally-friendly practice.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

1. Area of land sown with any legume in grassland (e.g. white clover, red clover, alfalfa).
2. Areas of arable land sown with any legume as protein crops (peas, beans, soybean etc.)

3. Provide an example of how this addresses a policy issue, or could be interpreted.

Use of legumes is a management practice that can contribute to calculations of greenhouse gas mitigation. Use of legumes may increase due to the crop diversification option in the new greening measure. This information will help track any changes in legume adoption over time, and differences across system.

E 14:GHG Emissions per ha

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

Greenhouse Gas emissions are a major issue for agriculture, as the agricultural sector is a major source of GHGs. There is a very strong pressure on farm producers to reduce their GHG footprint as part of sustainability schemes and producers' specifications.

The accumulation of several small changes in farm practice can have important improvements in GHG emissions for a farm enterprise.

There is a need for improved information on the production of greenhouse gases across different farming systems, and geographical areas, and there is an opportunity to learn and better transmit best practices to reduce GHG emissions.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

There may need to be system-specific questions, and current state-of-the art has been most developed for arable and livestock systems. As an example, the type of issues to be addressed could include:

1. Indirect energy usage (fertiliser, purchased feed etc.)
2. Direct energy usage (electricity and fuel from non-renewable sources)

Depending on definition variables required to calculated GHG emissions at farm level will vary
Using the IPCC methodology based on standard coefficients, variable requirements less onerous.
Production technologies breeding etc?

3. Provide an example of how this addresses a policy issue, or could be interpreted.

Major policy target as part of the CAP actions for climate change mitigation.

There is substantial interest in the long-term trends in GHG production, and how to improve measurement of the farm-level GHG footprint. Such approaches that incorporate farm practices can result in a lower GHG footprint for farms that undertake appropriate practices.

E 13:GHG Emissions per product

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

Greenhouse Gas emissions are a major issue for agriculture, as the agricultural sector is a major source of GHGs. There is a very strong pressure on farm producers to reduce their GHG footprint as part of sustainability schemes and producers' specifications. The accumulation of several small changes in farm practice can have important improvements in GHG emissions for a farm enterprise.

Many food processors are interested in the carbon footprint associated with the farm enterprise that is involved in the production of their chosen product. Thus, a grain company may be interested in the carbon footprint associated with the production of 1 kg of grain, whereas a milk processor will be interested in the carbon footprint associated with the production of 1 litre of milk. For mixed farms, this presents a specific challenge to allocate farm inputs and outputs to different products.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

There may need to be system-specific questions, and current state-of-the art has been most developed for livestock systems. As an example, the type of issues to be addressed in livestock farming include:

1. Quantities of purchased feed
2. Length of outdoor grazing season, with start and end dates
3. Age at first calving
4. Calving rate
5. Liveweight gain
6. Fertiliser use
7. Slurry spreading in spring, summer after cut of silage, and summer

(Note: Variables will overlap with E5 Nutrient Balance data requirements)

3. Provide an example of how this addresses a policy issue, or could be interpreted.

Major policy target as part of the CAP actions for climate change mitigation.

There is substantial interest in the long-term trends in GHG production, and how to improve measurement of the farm-level GHG footprint. Such approaches that incorporate farm practices can result in a lower GHG footprint for farms that undertake appropriate practices.

E 15: Carbon-sequestering land uses

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

Greenhouse Gas emissions are a major issue for agriculture, as the agricultural sector is a major source of GHGs that contribute to climate change. There is a very strong pressure on farm producers to reduce their GHG footprint as part of sustainability schemes and producers' specifications.

There are a number of land use types that can capture carbon, and thereby reduce the farm-level carbon footprint.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

Share of wooded/afforested areas

1. Area of wooded or afforested areas
2. Area under agroforestry
3. Permanent grassland

DATA ALREADY AVAILABLE

NO NEW DATA COLLECTION NECESSARY

3. Provide an example of how this addresses a policy issue, or could be interpreted.

Major policy target as part of the CAP actions for climate change mitigation.

There is substantial interest in the long-term trends in GHG production, and how to improve measurement of the farm-level GHG footprint. Such approaches that incorporate farm practices can result in a lower GHG footprint for farms that undertake appropriate practices.

E 16: WATER USAGE AND SOURCE

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

Fresh water is a scarce resource. The challenge of water scarcity and droughts needs to be addressed both as an essential environmental issue and also as a precondition for sustainable economic growth in Europe. An effective strategy towards water efficiency can make a substantial contribution from economic, social and environmental point of view.

On average, 44 % of total water abstraction in Europe is used for agriculture. Agriculture can impact in different ways on the good chemical and good quantitative status of groundwater and surface waters. Water quality may be negatively affected by the presence of pesticide residues, nutrients from fertilisers, or sediments from soil erosion.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

1. Water consumption; cost (€)
2. Volume
3. Fate of the water. % of cost and volume for domestic, irrigation, livestock, washing, others.
4. Source of the water % from reservoir, groundwater, tap, own storage.

3. Provide an example of how this addresses a policy issue, or could be interpreted.

- The European Union (EU) has established a Community framework for water protection and management. The Water Framework Directive plays a vital role in protecting water quality and quantity. This Directive requires Member States to establish river basin management plans, and to ensure that water pricing policies provide adequate incentives for users to use water resources efficiently.
- The cross-compliance framework includes statutory requirements related to water protection and management arising from the implementation of the groundwater directive and nitrates directive, as well as GAEC standards.
- Payments under Article 30 of the Rural Development Regulation will contribute to the implementation of the Water Framework Directive.

E 17: IRRIGATION PRACTICES

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

Irrigation helps improve crop productivity and reduce risks due to dry periods, making it possible to grow more profitable crops. However, irrigation is also the source of a number of environmental concerns, such as the excessive depletion of water from subterranean aquifers, irrigation-driven erosion and increased soil salinity. On the other hand, traditional irrigation systems create diverse and intricate landscapes, which support a variety of wildlife and have important cultural and historic value.

Irrigation is one of the most important causes of water consumption and its efficiency depends on the irrigation practices. The most intensive irrigation agriculture can be an important contribution to groundwater pollution (fertilizers, pesticides) and eutrophication of surface waters.

Over-exploitation of aquifers can degrade the quality of water. The amount of water used for irrigation depends on factors such as: climate, crop type, soil characteristics, water quality, cultivation practices.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

1. Area and cultures under irrigation
2. Main type of irrigation system
3. Height difference for pumping (energy consumption)
4. Irrigation managed by an Irrigation Community?

3. Provide an example of how this addresses a policy issue, or could be interpreted.

- Water Framework Directive plays a vital role in protecting water quality and quantity, management plans to ensure adequate incentives for users to use water resources efficiently.
- The cross-compliance framework includes statutory requirements related to water protection and management arising from the implementation of the groundwater directive and nitrates directive, as well as GAEC standards.
- Article 46 of the Rural Development Regulation sets out conditions to be considered eligible expenditure in the case of irrigation investments. Certain rural development measures support investments for improving the state of irrigation infrastructures or irrigation techniques that require the abstraction of lower volumes of water, as well as actions to improve water quality.

4.2 Social

S1: Advisory service provide to the farm

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

Advisory service provision is an important component of the knowledge, information and innovation system in agricultural holdings. It is expected that those farms accessing to advisory services are better informed, produce better knowledge and therefore, may be more innovative. Advisory services are variable among countries and systems involving several public and private actors such as national, regional or local advisory agencies, research centres, universities, agricultural schools, NGOS, companies (upstream and downstream), consultants or agricultural advice companies, farmers cooperatives, chambers of agriculture, farmers groups. Due to this diversity on providers and type of service (from individual advice, group advice or simply information exchange), only a main part of the information would be possible to collect.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

Frequency of advisory services received [*How many times per year do you receive advisory services?]*

-Type of provider [*From whom? (options: □national provider, □farmers based providers, □universities, □NGO, □private services , □partner firm, □other)]*

Do you co-operate with any Agricultural Advisory Centre to an extent that exceeds agricultural accounting (e.g. to draw up a fertilising plan, to fill in an application for subsidy, to get assistance to change a plant or animal production technology)?

1. Yes 2. No

2A. *[If not, please choose/complete]* Why?

1. There is no need to do so.
2. There is a need to do so, but there are no advisors.
3. I do not have the funds to use consulting services.
4. Other reasons …….. *(Which ones?)*

3. Where do you usually get information about the obligatory legal requirements concerning environmental protection to be complied with by a farmer in order to be granted a subsidy? *[Please, underline the answer]*

1. I look for it in the Internet or newspapers, I watch TV programmes.
2. I obtain it from advisors at Agricultural Advisory Centres.
3. I obtain it from ARMA employees.
4. I obtain it from a private consulting company.

4. Do you think that the institutions active in the farmer's environment (e.g. Agricultural Advisory Centres, ARMA) properly co-operate with a farmer?

1. Yes 2. No

4A. *[If not]* How should the co-operation between a farmer and the institutions be facilitated?

3. Provide an example of how this addresses a policy issue, or could be interpreted.

Advisory services contribute to the dissemination of innovative agricultural practices to increase productivity and improve environmental performance.

Advisory services and the building of knowledge networks are part of rural development program.

This information will help to track changes on how do farmers get information and knowledge to make innovations over time and differences across systems.

S2: Education and training

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

Education is a variable that represents the qualifications of human resource. Level of education can be related with other social and economic aspects of agriculture. While formal level of education is not influenced by specific projects on rural development, non- formal education (such as trainings) is intended to develop specific skills and competences to improve job productivity. Both factors describe agricultural labour and human capital.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

1. Education level [*How many years do you study? What is your highest degree achieved?](not to be discussed in stakeholders workshop)*
2. Person-days trainings per year **[***How many days of training have you or your family labour received during last year?]*

Used in survey (dedicated to FADN farmers) questions which connected with farmer education were included:

1. Do you plan to continue vocational education (e.g. to enrol for courses organised by Agricultural Advisory Centres, ARMA, or to study at a university or college) in order to be able to develop and manage your farm in a better way?
1.Yes
2. No, because ……..

1A. [If so] Please, indicate the education you would be interested in.
[Please underline the answer(s)]
courses, training, secondary technical school, vocational school, university
[If university was marked, please specify]
Bachelor/Engineer, Master's, Doctor, postgraduate
[If university was marked, please specify]
full-time, extramural, part-time studies

1B. Which fields of education or courses are you interested in?
[Please underline the answer(s)]
farming, non-agricultural activities, the environmental protection, economics, agricultural economics, biology, politics, law, veterinary medicine, other

3. Provide an example of how this addresses a policy issue, or could be interpreted.

Trainings can be correlated with the professionalization of labour and adoptions of innovative activities in rural areas. This information will be used to measure the state of capacities development for agricultural labour, establish casual relationships in sustainability achievements and make comparisons across sectors and countries.

S3:Ownership/management

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

Management and ownership information provide a basic yet important starting point in terms of farm level decision making. Additional information regarding external knowledge and advisory services can contribute better understanding the factors influencing the farm level decision making. This structural information may provide insight of the complex process of decision making. All of this has effect on the resilience of decision making. Finally it can shed the light of non-family type multiple enterprise structures exist for different optimization reasons (e.g. taxing)

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

1. Type of external advisory/information used for management. (SEE S1 ALSO)
2. Details about the ownership structure (shares, “why was this chosen” Perhaps EI 1 organisational innovation?).
3. Subsidiary information.

4. Provide an example of how this addresses a policy issue, or could be interpreted.

Multi-enterprise structure can contribute to optimizing tax burden and/or relevant from risk management point of view.

Better knowledge and understanding about the source and type of information used during decision making can contribute to better design relevant interventions (e.g. RDP).

Aging of the farming structure is not well understood, more information on this regard can help to design intervention that can promote the renewal of the farming sector at the desired rate

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S4: Social engagement/participation

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

The social engagement of a farm/farmer into different groups (e.g. farmers' union, environmental group, educational association, local political party, farmers' groups, etc.) may help understanding some of the orientations undertaken at farm level. Information on social engagement is often used in the literature to capture farm/farmer's awareness on particular issues (e.g. environmental awareness). Such a characteristic is for instance one of the common drivers explaining the uptake of action benefiting to the environment (e.g. conversion to organic farming, implementation of agro environmental schemes (AES), etc.). AES participants (compared to non-participants) are for instance more likely involved in Farmer's Unions, farming groups with nature orientation, and environmental association.

Furthermore, the magnitude of the engagement/participation can be important as being for instance a member of a nature association or a board member of a nature association does not imply similar commitment. This magnitude could also be captured asking about the participation into activities organised by the association/organisation (e.g. participation in activities: Always; Occasionally; Never).

Besides, asking a farmer for his/her hobbies (and frequency of practice) could also help gauging his/her consciousness of particular issues. Asking about hobbies is not an issue that was raised during Warsaw meeting, but if you feel that including that item could apply, feel free to solicit.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

Farmers will be asked about their involvement in the listed organisations, and whether they are simple members or member of the board.

Suggested categories would be:

- Farmers' Union;
- Professional organisation (e.g. chamber of agriculture, technical institute, etc.);
- (Local) farmers group mainly oriented at improving agriculture (e.g. testing new agricultural techniques, elaborating collective development plan, etc.)
- (Local) farmers group mainly oriented at nature conservation and landscape management;
- Environmental or nature association;
- Civil association (e.g. village renewal, living in the area, women's group);
- Religious association;
- Sport club / recreation organisation;
- Educational (school) association;
- (Local) political party;
- Local/territorial/municipal government.

During the last 10 years, we have designed various questionnaires on different aspects and conducted the related surveys with farmers.

From these previous experiences we could imagine propose the following question:

Are you involved in one of the listed organisations? *(please check what is applicable)*

Organisation	Member		Member of a board	
	yes	No	yes	no
▪ Farmers' Union	☐	☐	☐	☐
▪ Professional organisation (e.g. chamber of agriculture, technical institute, etc.)	☐	☐	☐	☐
▪ (Local) farmers group mainly oriented at improving agriculture (e.g. testing new agricultural techniques, elaborating collective development plan, etc.)	☐	☐	☐	☐
▪ (Local) farmers group mainly oriented at nature conservation and landscape management	☐	☐	☐	☐
▪ Environmental or nature association	☐	☐	☐	☐
▪ Civil association (e.g. village renewal, living in the area, women's group)	☐	☐	☐	☐
▪ Religious association	☐	☐	☐	☐
▪ Sport club / recreation organisation	☐	☐	☐	☐
▪ Educational (school) association	☐	☐	☐	☐
▪ (Local) political party	☐	☐	☐	☐
▪ Local/territorial/municipal government	☐	☐	☐	☐
▪ Other club/association/organisation. *Please specify:* _____	☐	☐	☐	☐

3. Provide an example of how this addresses a policy issue, or could be interpreted.

See Part 1.

S5: Employment and working conditions

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

Jobs creation is one of the positive impacts of agriculture in rural areas. Among Europe, agriculture involves around 25 million of persons and an estimated equivalent of 10 million of full-time equivalents jobs. Agriculture occupation has special characteristics such as prevalence of family labour, part-time regular employment and seasonality occupation. As a decisive part of the quality of life, the measurement of quantity and quality of the job in the agricultural sector is one of the crucial dimensions in social sustainability.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

1. Workforce per year: family labour, non-family labour regularly employed, non-family labour employed on a non-regular basis [*How many people do you employ?]*
2. Working hours per week [*How many hours per week do the family labour work?]*
3. Working weekends per year [*How many weekends have you worked per year?]*
4. Holidays per year [*How many days for holiday per year?]*
5. Annual rate of accidents, occupational diseases and lost days due to sickness [*How many accidents or occupational sickness were reported during the last year?] [How many days were lost due those occurrences?]*
6. Avail of replacement in case of sickness [*Do you have avail of replacement in case of sickness?]*

3. Provide an example of how this addresses a policy issue, or could be interpreted.

The quantitative variables signalize the achievement of jobs and the quality of employment life of farmers, both aspects an objective of rural development programs.

This information will help track any changes in job quantity and quality among the farms surveyed and can be compared across regions, systems, countries and economic sectors. Examples of comparisons of these indicators across Europe and sectors can be found on http://www.europarl.europa.eu/document/activities/cont/201107/20110718ATT24284/20110718ATT24284EN.pdf

S6: Quality of life/Decision Making

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

Autonomy and meaningfulness of the job is one of the characteristics with more influence on job satisfaction and hence quality of life. These characteristics cannot be measured with quantitative indicators and many other non-controllable aspects (such as individual, economic and cultural factors) can have an influence on them. However, quality of life is one of the main objectives of rural development policies, so it is worth to make an attempt to measure it in a subjective way.

2**. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).**

1. Perceived degree of autonomy [*How autonomous do you feel with respect to the decisions of your farm? (rate from 1-5)]*
2. Perceived job satisfaction [*How satisfied do you feel with respect to being a farmer? (rate from 1-5)]*
3. Perceived quality of life satisfaction [*How satisfied do you feel with respect to your quality of life? (rate from 1-5)]*

Additional Variables:

Does the income obtained from your agricultural activities assure a decent standard of living?

1. Yes 2. No

What is the main determinant of a decent standard of living in your opinion?

……

Access to quality broadband/internet connection. (ICT usage may be limited without)

3. Provide an example of how this addresses a policy issue, or could be interpreted.

Farmer's perceptions about their job can be influenced by cultural and individual factors beyond the farm level. Nevertheless, it can indicate the individual perspective on a specific point of the time, relevant for policy designers. This information will be used to make comparison across regions and system and possible determine causalities among quality of life perceptions and economic, social and environmental conditions.

S7: Social diversification: improving the image of farmers/agriculture in local communities

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

Social Diversification refers to the expansion of the range of rural activities both inside and outside the farm.

The indicator "Social diversification" can support the agricultural income, the social security, and the social capital of the community. The new generation of farmers is at the centre of the new food system, and they need a diverse knowledge base and applied strategies to succeed as entrepreneurs.

Diversification of agricultural income is a common risk management strategy for diversified farming systems. Farmers try to have the opportunity for a wider market access and better market flexibility. They try to implement many other active sales or to redirect their sales towards new markets (like on farm sales, direct selling, farmer markets or fair/exhibitions).

The "Social diversification" indicator has benefits for both producers and consumers. Producers can obtain higher prices and promote better their specific farm products. Farmers can recognize consumer' needs through the conversations with them. Positive effects will have not only on the food quality-related product aspects but also on the value of products. On the other hand, consumers can gain greater availability of high-quality products in respectable prices.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

1. On-farm sales, direct selling, farmer's markets, fairs/exhibitions
2. Giving apprenticeships, hosting open day events,
3. Participation in nature conservation, quality certification programs/covenants.

(Note: variables required for Q1 here could be partially covered under markets outlets see EI 3)

1. Participation in local initiatives such as festivals, competitions, etc.

(Note: variables required for Q1 here could be partially covered under markets outlets see EI 3

We can include some extra categories in S4 Social engagement/participation to cover points 2, 3 and 4)

Binary Variable. Social Diversification Index of the household head (Sum of memberships) or of the farm

3. Provide an example of how this addresses a policy issue, or could be interpreted.

Building of relationships between producers and consumers has an impact on the image and the viability of the farm, and this makes it as a new model of agriculture.
Use of diversification of income is a common strategy that small farmers follow.
This strategy can help farmers to support their income and reduce their risk. It is used as a risk management strategy or as a safety net.

4.3 Economic/Innovative

EI 1: Innovation

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

An innovation is the introduction of a new or significantly improved product, process, organisational method, or marketing method by your farm. The innovation must be new to the farm, although it could have been originally developed by other farms / enterprises.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

Questionnaire with a limited set of variables.

These are the questions from the Community Innovation Survey (CIS). The questions may need to be adapted for the agricultural context.

*Definition: A process innovation is the implementation of a **new** or **significantly** improved production process, distribution method, or supporting activity.*

 Process innovations must be new to your enterprise, but they do not need to be new to your market.

 The innovation could have been originally developed by your enterprise or by other enterprises.

 Exclude purely organisational innovations – these are covered in section 9.

During the three years…to...did your enterprise introduce:	**Yes**	**No**
New or significantly improved methods of manufacturing or producing goods or services		
New or significantly improved logistics, delivery or distribution methods for your inputs, goods or services		
New or significantly improved supporting activities for your processes, such as maintenance systems or operations for purchasing, accounting, or computing		

*Definition: A product innovation is the market introduction of a **new** or **significantly** improved **good or service** with respect to its capabilities, user friendliness, components or sub-systems.*

 Product innovations (new or improved) must be new to your enterprise, but they do not need to be new to your market.

 Product innovations could have been originally developed by your enterprise or by other enterprises.

*Definition: A **good** is usually a tangible object such as a smart phone, furniture, or packaged software, but downloadable software, music and film are also goods. A **service** is usually intangible, such as retailing, insurance, educational courses, air travel, consulting, etc.*

During the three years -- to --, did your enterprise introduce:	**Yes**	**No**
New or significantly improved goods (*exclude the simple resale of new goods and changes of a solely aesthetic nature*)		
New or significantly improved services		

Marketing innovation

A marketing innovation is the implementation of a new marketing concept or strategy that differs significantly from your enterprise's existing marketing methods and which has not been used before.

 It requires significant changes in product design or packaging, product placement, product promotion or pricing.

 Exclude seasonal, regular and other routine changes in marketing methods.

During the three years -- to --, did your enterprise introduce:	**Yes**	**No**
Significant changes to the aesthetic **design** or **packaging** of a good or service (*exclude changes that alter the product's functional or user characteristics – these are product innovations*)		
New media or techniques for **product promotion** *(i.e. the first time use of a new advertising media, a new brand image, introduction of loyalty cards, etc.*)		
New methods for **product placement** or sales channels *(i.e. first time use of franchising or distribution licenses, direct selling, exclusive retailing, new concepts for product presentation, etc.)*		
New methods of **pricing** goods or services *(i.e. first time use of variable pricing by demand, discount systems, etc.)*		

3. Provide an example of how this addresses a policy issue, or could be interpreted.

Smart growth: developing an economy based on knowledge and innovation is one of the main objectives of the Europe 2020 strategy. These indicators allow for the monitoring of innovations in the agricultural sectors and allow analysis on the driving forces of innovations, the impact on productivity etc.

EI 2: PRODUCING UNDER A LABEL or BRAND

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

Producing under such quality label(s) is made possible through public and private certification schemes (http://ec.europa.eu/agriculture/quality/index_en.htm).

Producing under a brand or a label is one way for the farmer to signal the quality of his/her products (by taking advantage of brand or label reputation). Consumers are usually willing to pay a premium for labelled products and as a consequence product labelling can provide some insurance against price uncertainty and volatility. Assessing the impact of labelling on farm's income and income volatility can provide useful information to farmers. These would provide an estimate of the benefits of labelling, that farmers can then compare to the costs of the certification process. The farmer may also be interested to relate this information to farm performance (e.g. profitability) to see if it is worth it.

A farmer may also be interested to see where he/she stands in comparison to other farmers in his/her type of production (e.g. dairy) and region. This may give the farmer an indication whether producing with higher value is possible in his/her case.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

The information could be collected in the following form:

	What share of the Total output crops & crop production (SE135) stems from a label or brand? (%)	What share of the Total output livestock & livestock products (SE135) stems from a label or brand? (%)	Since when does the farm produce under this label or brand? (year)	What farm UAA is under organic farming? (ha)
Organic label				
PDO				-
PGI				-
TSG				-
Other (private certification)				-

PDO/PGI/TSG: There are three types of Geographical Indicators;

- **Protected Designation of Origin (PDO)** where the product must be produced, processed and prepared in

the geographical area and where the quality or characteristics are essentially due to that area.

- **Protected Geographical Indication (PGI)** where the product must be produced or processed or prepared in the geographical area and where a specific quality reputation or other characteristics are attributable to that area
- **Traditional Speciality Guaranteed (TSG)** where the product must be traditional (25 years/handed down through generations) or established by custom.

Traditional geographical or non-geographical names designating an agricultural product or a foodstuff can also be considered. E.g. Feta

2/ SE135 and SE206 are the farm output variables that are already in EU FADN.

The main types of information are:

- Type (details) of Product
- Number of markets selling into
- Share of production under label
- Time period selling under label
- Indicate whether or not you receive a price premium for the product

3. Provide an example of how this addresses a policy issue, or could be interpreted.

- This information can provide knowledge about the resilience of farms when facing difficult conditions (agronomic or economic conditions).
- It deals with how farms stabilise their market outlets. Producing under a brand or a label may enable farms to be less affected by price variability (since production price for brands/labels may be less subject to world price shocks).
- Producing under a brand or a label may also enable farms that are located in less favoured areas to survive (since a brand may be tied to a *territoire*, or may attract tourism).
- Studying farmers' decision to certify their products and the impact of certification/labelling on income and income volatility may thus help understanding how farmers manage price risk on their farm.
- This indicator will also help assess whether the EU regulation on quality scheme help farmers improve their sustainability. The indicator is not exactly an indicator of sustainability outcome, but a determinant of sustainability.

NOTE: This information is often linked with the information on "on-farm processing". Collecting such additional information would also be relevant.

EI 3: TYPES OF MARKET OUTLET

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

Here also it can help the farmer understand where he/she stands in comparison to other farms, and what could be possible for his/her farm.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

Based on FP7 CAP-IRE project
http://prodinra.inra.fr/ft?id={4857A517-7BB5-4930-8B16-3741AA01CFAE}#page=111
the information could be collected in the following form:

	What is the share of the farm Total output (SE131) that is sold to: (%)	**Does the farm have a contract for most of the output?**
Processors		□ No contract □ Annual contract □ Pluri-annual contract
Private wholesalers/retailers		□ No contract □ Annual contract □ Pluri-annual contract
Cooperative wholesalers/retailers		□ No contract □ Annual contract □ Pluri-annual contract
Middleman (e.g. cattle trader)		□ No contract □ Annual contract □ Pluri-annual contract
Direct sale to final consumers		□ No contract □ Annual contract □ Pluri-annual contract
Other farms		□ No contract □ Annual contract □ Pluri-annual contract
Other		□ No contract □ Annual contract □ Pluri-annual contract

Note: SE131 is the farm output variable that is already in EU FADN.

3. Provide an example of how this addresses a policy issue, or could be interpreted.

This information provides information on economic and social sustainability. Economic sustainability: shows if the farm is at risk of losing its outlets (stability of market outlets). Social sustainability: shows the operators in rural areas benefit from farming activities. The decision to contract with distributors may allow the farmers to hedge against the risk of demand uncertainty and volatility. Understanding who, in the farmers' population, decides to sign agreements with distributors and how such contracts impact on farm income and income volatility can help understanding another aspect of risk management on the farm.

This directly addresses the FLINT policy topic of market stabilisation and risk diversification in bringing a product to a new/alternative market.

EI 4: Past/Future duration in farming (Survival propensity)

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

The issue of inheritance is an important issue for farm level decision making. Current decision making and future decision making is largely influenced by existing farm governance structures. Who influences or makes the final decision on the farm. It is expected the number of years' experience as the main farm decision maker also influences the decision. The presence or absence of an heir is also influential in identifying farmer's objectives and future intentions.

(Note: It may also be interesting to look at national governance structures which may facilitate/hinder transfer of the far. This is an influential factor but one that is beyond the farm gate and so possibly outside the scope of this project.)

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

The suggested indicator could be measured using a variety of mechanisms.

1. Presence or absence of successor? (Y/N)
2. When do you intent to hand over the farm? 5years/10years/15years/20years/Not sure
3. In what year were you born? (In FADN?)
4. In what year did you start farming as the main farm decision holder?
5. Have you identified a successor to take over from you here on the farm? (Yes/No/Not decided/Don't know (specify)

3. Provide an example of how this addresses a policy issue, or could be interpreted.

The issue of succession on farm directly relates to the core of sustainability focusing on future generations of farming. Given the intergenerational ties between families and farming tradition, farm succession is a key issue emerging for future policy. It is important for policy makers to identify who is the decision maker to tailor a suited policy approach in influencing change in farm level activities. It is equally important for farmers to think about this as an issue for the future of their farms. Identifying a successor gives additional security and increased autonomy in decision making.

EI 5: Efficiency field parcel (LPIS)
1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.
Land Parcel Identification System, LPIS, offers field parcel data of the farms. Long distances from farms to field plots and small field plots increase the energy consumption and for example labour costs. Field parcel data/indicators with the economic indicators of the same farms can offer valuable information about the influence of long distances to field plots to production costs of the farms.
2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).
Field parcel data can be collected from Land Parcel Identification System (LPIS). Data will not be provided by the farmer. The LPIS indicators will be: Number of plots, size of all plots (or average size of plots?) and average distance from plots to farm (via roads?).
3. Provide an example of how this addresses a policy issue, or could be interpreted.
The size of farms is growing rapidly and new field plots are rented or purchased by the farmers. Very often the distances from the farm to new field plots are growing longer and longer. Long distances will increase production costs and consumption of energy as well. LPIS indicators connected to economic indicators will offer possibility to study these issues. Field parcel indicators can also be supplied to farmers.

EI 6: Modernisation of the farm (Investment)

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

Investments in the processing and marketing of existing products, as well as in the development of new products, processes and technologies can improve the added value to agricultural and forestry products. Such investments could be the construction, acquisition or improvement of immovable property, the purchase or lease-purchase of new machinery and equipment and general costs linked to expenditure such as patent rights and licences. Increasing the competitiveness of the agricultural sector requires an improvement of the productivity of physical capital. Modernisation of farms is crucial to improve their economic performance through better use of the production factors including the introduction of new technologies and innovation.

Modernization is viewed as a technological progress in order to reach and/or maintain sustainable development/growth. Productivity growth can be enhanced through two pathways: technological change (TC) and technical efficiency change (TEC). TC captures the improvement in best practice through adoption of new technologies resulting in more efficient farming systems (i.e. the best farms getting better). TEC captures improvements in TFP arising from 'slower moving' farms adopting currently available technologies and knowledge. It reflects the aggregate influence of 'average' farms catching up to the best-performing farms. The Malmquist index method allows total factor productivity change (TFPC) decomposition over time into a catching-up effect (technical efficiency change (TEC)) and a frontier shift effect (technological change (TC)), which in fact one of the new impact indicators of the RDP 2014-2020, based on aggregate level data. This requires output and input variables already available in the FADN.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

Alternatively, modernization can be captured through a number of more qualitative type of information (possible combine to one composite indicator):

1. Current status of farm assets (Depreciation of existing assets)
2. Level of productivity (land/labour/capital): SO/AWU; SO/UAA; SO/LU; SO/asset value
3. Average weighted age of assets (equipment): (D_AD_4010_V/D_DY_4010_V)

All these data can be calculated from current FADN data (Table D). If we want to reflect the technological advancement of a farm, we can examine the labour force of the farm as well. If we assume that the more technologically developed a farm is the less labour force is used. In this way we can rank the farms by the usage of annual work unit per standard output.

3. Provide an example of how this addresses a policy issue, or could be interpreted.

Investment in infrastructure through modernisation of equipment reflects technical change and technological advancement which from a farm perspective should result in increased returns. The returns to investment may be more than purely financial or efficiency improvement it could also represent a time saving return for example.

EI 7: Insurance (events outside control of farm) Also to include personal (disability) & farm (building structure) insurance

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

Insurance of farm equipment, personal health, weather effects etc. can reduce the risks a farmer encounters in every day practice. In case of an accident the damage or losses are compensated. This reduces the loss of income in case of an accident.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

The main types of information are:

Production risks

1. Insured production risks (for example: weather insurance)
2. Transaction amount
3. Allocation of insurance

Asset risks

4. Insured assets risks (for example: car/tractor/building insurance)
5. Transaction amount
6. Allocation of insurance

Personal risks

7. Insured personal risks (for example: life insurance, health insurance etc.)
8. Transaction amount
9. Allocation of insurance

3. Provide an example of how this addresses a policy issue, or could be interpreted.

Insurances provide protection when unanticipated/unavoidable events occur; if such events result in losses (production/assets/personal injury) the farmer is compensated. It provides reduced risk in relation to farmer's income. The information about insurances in agriculture will help to monitor the risks awareness of farmers.

EI 8: Share of output under contract with fixed price Delivery contracts
1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.
Prices of agricultural products are getting more and more volatile due to less price and market protection from governments (EU). With fixed price delivery contract the farmer can reduce the price risk for the output products. The share of output under contract with fixed price delivery contracts tells whether the farmer is operating entirely on the "free" market or controls the output prices risk with fixed price contracts. With this information research can be done, for example, whether farmers with fixed price contracts perform financially better than farmers who do not use these contracts.
2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).
The main types of information are: 1. Type of contract (for example: supply contract or futures market contract) 2. Product(s) relevant for contract in combination with share of production 3. Time period of contract
3. Provide an example of how this addresses a policy issue, or could be interpreted.
The share of output under contract shows how much farmers rely on the "free" market and the risk of possible changes of prices.

EI 9: Risk exposure (non-agricultural activities)

1. Provide a high-level description of the relevance of the topic for introduction of the topic to the farm stakeholder.

Income diversification is a well-known way to lower the risk of income losses from agricultural production. Agricultural output prices are getting more and more volatile. This means a farmer does not have the guarantee of a sufficient income from agricultural production. Income from non-agricultural activities can have a substantial share in the total income of the farm. Insight in the income from non-agricultural activities can help farmers to benchmark with colleagues who also develop non-agricultural activities.

2. Describe the main types of information that will be provided by the farmer, by providing an example from your experience (or describe based on your knowledge even if you have not done it yourself).

The main types of information are:

1. Number of activities
2. Type of activities
3. Revenues from activities
4. Costs from activities
5. (External) employees per activity

Already in FADN:

K177 Contract work for others

K179 Farm tourism

Not in FADN:

Revenues from energy sales

Revenues from agricultural wild life management

3. Provide an example of how this addresses a policy issue, or could be interpreted.

Within the CAP less price and market support is given to agricultural product. Liberalization of agriculture markets is getting more important. This means that farmers must deal with more fluctuating prices. Income stability is no longer certain in a liberalised agricultural market. Non-agricultural activities can give a farmer more certainty about the income over a period of time.

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