



# EXAMPLE 'USING FLINT INDICATORS FOR EVALUATING RURAL DEVELOPMENT FOCUS AREA 2 A'

WP 2 'KNOWLEDGE TRANSFER'

THEMATIC WORKING GROUP NO 9

'RESEARCH PROJECTS TO SUPPORT BETTER DATA FOR  
EVALUATING THE CAP'

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## Introduction

This document is one of the outcomes of the Working Package 2 'Transferring knowledge for better use of data for evaluating the CAP' which aims to support the transfer of various solutions included in the [Evaluation Knowledge Bank](#) to the CAP evaluation context.

This document provides an example of how to use some of the [sustainability indicators at the farm level](#) of the Seventh Framework Programme project FLINT: Farm Level Indicators for New Topics in policy evaluation' in the assessment of economic performance of farms.

This is a **non-binding document**, which serves as a knowledge transfer tool which will facilitate the transfer of the Evaluation Knowledge Bank content into practice.

The drafting of this document has been carried out by evaluation experts in the context of the Evaluation Helpdesk's Thematic Working Group (TWG) on the '[Research projects to support better data for evaluating the CAP](#)'.

This document has been developed by Marili Parissaki, Dimitris Skuras with input from project documentation and project partners (notably, Hans Vrolijk).

## Example 'Using FLINT indicators for evaluating Rural Development Focus Area 2A (Economic performance)'

### Background of the FLINT project

Given the continuous evolution of the CAP, the FLINT project considers both timely and relevant to take stock of current evaluation practices and specifically focus on which indicators are or can be employed to aid our understanding of the relative success of policy targeting. In addition, the stock of data available in the Member States' FADN datasets varies and the capacity/willingness of different countries to collect additional data is also variable. Therefore, FLINT has carried out pilots in numerous countries with different data collection methods with the objective to establish a tested data-infrastructure with up-to-date farm level indicators for the monitoring and evaluation of the CAP.

In this context, FLINT has selected a [set of farm level indicators](#) to provide information to evaluate existing and new policy topics. The indicators were selected using a three-stage process: identification of current and future policy needs, comprehensive review of current literature for measuring farm sustainability and analysis of feedback from FLINT partners. 33 sustainability indicators (environmental, economic and social indicators) were selected and subsequently piloted on approximately 1,000 existing Farm Accountancy Data Network (FADN) farms in the nine Member States that make up the FLINT partnership.

This document aims to give an example of how to use some of the FLINT indicators in practice for evaluating farm economic performance. Out of the 33 sustainability indicators, we have selected a couple that are relevant for evaluating farm economic performance.

### Scope for evaluating economic performance of farms

The economic performance of farms is the subject of evaluation under Focus Area (FA) 2A of rural development programmes ('Improving the economic performance of all farms and facilitating farm restructuring and modernisation, notably with a view to increasing market participation and orientation as well as agricultural diversification').

Economic performance of farms relates to various aspects of farm management which improve their economic performance directly or indirectly and in a more sustainable manner. One of these aspects is **investments in modernisation of the farm**, which is the focus of this example.

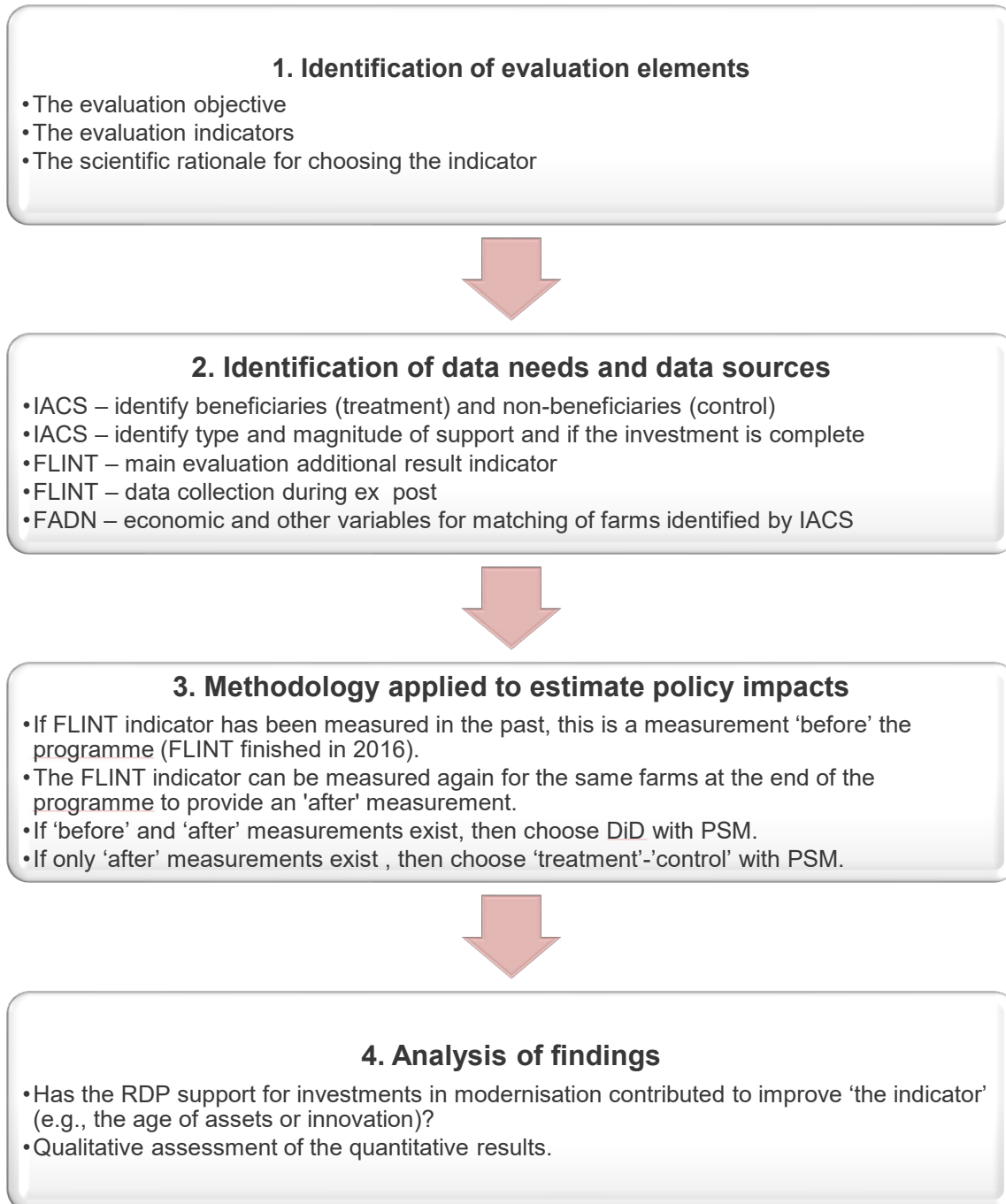
RDPs provide farm investment support with the aim, amongst others, to modernise agricultural holdings to improve their economic performance through more efficient use of the production factors including the introduction of new technologies and innovation.

In order to evaluate economic performance as a result of receiving RDP support, in view of the ex post evaluation of RDPs 2014-2020, an approach based on the experience of FLINT is suggested below.

## Suggested approach for evaluating economic performance

The proposed approach is summarised in the following figure and detailed in the paragraphs that follow.

**Figure 1: Four steps proposed for evaluating economic performance**



## Step 1: Identification of evaluation elements

The following common evaluation elements are proposed in the [Commission Implementing Regulation 808/2014](#), for evaluating FA2A:

Common evaluation question (CEQ) 4: To what extent have RDP interventions contributed to improving the economic performance, restructuring and modernisation of supported farms in particular through increasing their market participation and agricultural diversification?

### Judgment criteria:

- Agricultural output per annual working unit of supported agricultural holdings has increased
- Farms have been modernised
- Farms have been restructured

### Indicators:

- Change in agricultural output on supported farms/Annual Work Unit (AWU) (*Complementary Result Indicator 2*)
- % of agriculture holdings with RDP support for investments in restructuring or modernisation (*Result Indicator 1 / Target Indicator 4*)

This common result indicator R1 provides quantitative evidence on the share of holdings that use RDP investment support for modernisation and also restructuring. This indicator is somehow generic in nature, and it is therefore proposed to use some additional indicators, provided by FLINT, in order to capture more detailed/disaggregated components of modernisation, notably the age of assets and innovation that is brought about by investments in farm modernisation.

Additional FLINT result indicators for modernisation:

- Modernisation of farm investment (in terms of age) (*Economic Indicator 6*). This indicator consists of the following sub-indicators:
  - Current status of farm assets (Depreciation of existing assets)
  - Level of productivity (land/labour/capital)
  - Average weighted age of assets (equipment)
- Innovation practices at the farm (*Economic Indicator 1*)

From these indicators and sub-indicators, the following two are chosen to demonstrate the potential use of FLINT in evaluation. The rationale for choosing these additional (FLINT) indicators is described below:

- ◆ Modernisation in terms of age of assets (EI6)

FLINT assumes that farm investment contributes to modernisation of equipment through technological change and technological development. Investments influence the **age of assets** and a [FLINT study](#)<sup>1</sup> has shown there is a close link between the age of assets and farm economic performance in terms of profitability and labour productivity. The study concluded that those farms where the average age of machinery is less than six years produce 62% more output per annual work unit (CRI 2) compared to those farms where the average

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<sup>1</sup> Effect of age of assets on farm profitability and labour productivity: <https://www.flint-fp7.eu/downloads/reports/D5.2f.pdf>

age of machinery is more than six years. This shows there is a correlation between CRI 2 and the age of assets and further justifies the FLINT proposal to assess also the age of assets.

#### ◆ Innovation (EI1)

The starting point is the definition of innovation for the FLINT project purposes. Innovation is defined as the introduction of a new or significantly improved product, process, organisational method, or marketing method by a farm. The innovation must be new to the farm, although it could have been originally developed by other farms / enterprises.

#### **Content of the innovation indicator:**

The innovation indicator is an aggregate one. Innovation is having one or more of the following types of innovation (farms with innovation):

- Product innovation that is new for the farm/holding within the last three years, but not new to the market (*product not new*);
- Product that is new to the market (*product new*);
- Process innovation that is new for the farm/holding within the last three years, but not new for the market (*process not new*);
- Process innovation that is new for the farm/holding and new for the market (*process new*);
- Market and organisational innovation (*organisational*).

## **Step 2: Identification of data needs and data sources**

The list of variables included in the additional indicator for **modernisation** (FLINT indicator EI6) and their data sources are presented in Table 1. These variables can be used to calculate the effect of investments, i.e., technical development at a micro-level (e.g. income, profits, employment, gross production value and labour productivity).

**Table 1: List of variables and data sources**

<b>Name</b>	<b>Source</b>	<b>Description</b>
Age of assets in terms of machinery (average weighted age of assets: equipment)	FLINT	Economic indicator which reflects the level of development of the farm
SE131/SE441	FADN	Total output per total fixed assets
SE410/SE441	FADN	Gross farm income per total fixed assets
SE275/SE131	FADN	Total intermediate consumption per total output
SE131/SE010	FADN	Total output per annual work unit
SE485/standard output	FADN	Total liabilities per standard output
SE455+SE450/standard output	FADN	The value of buildings and machinery per standard output



According to Table 1, FADN is used as a source for data on economic variables, while FLINT also proposes the collection data in relation to the age of assets. FADN collects data on value and depreciation of assets, but this data does not provide enough information to calculate their average age, since the second-hand machinery would distort the results. The value added of FLINT is that it complements FADN data by directly collecting data on average age of assets and in this way the impact of age structure of capital goods can be directly evaluated.

The way in which FLINT collected data for the age of assets is presented below. Although this was a one-off exercise in the case study countries, it can be replicated following the same approach.

#### How was data on age of assets collected in FLINT

In FLINT, data was collected for the most relevant groups of machinery and buildings. For the machinery, 19 groups have been distinguished. Six different groups have been established just for tractors, based on their performance. Different building units were defined according to their construction. Livestock buildings were expressed in places, the different storage places in m<sup>2</sup> or m<sup>3</sup>, and wine storage equipment in litres. The following farm types were involved in the calculation: dairy farms, sheep farms, pig farms and wineries.

The age of machinery could not be calculated on the basis of simple mathematical average. Each element of machinery has a considerably different acquisition cost. To address this issue FLINT applied a weighting scheme. The factors were calculated based on the average investment cost of each machinery item. Both national statistics and FADN were used.

The data/information source for the **innovation** indicator (FLINT indicator EI1) was a simple survey with yes/no answers to a limited number of questions, taken from the [Community Innovation Survey](#) and adapted to the agricultural context.

Finally, the FADN sample of farms must be linked to IACS in order to have a detailed knowledge of the type and amount of support directed by the RDP to the farms.

### **Step 3: Methodology applied to estimate policy impacts**

For the two proposed modernisation indicators, the analytical approach is Propensity Score Matching (PSM)<sup>2</sup>. In this case, the treatment is binary and can be formulated as whether the farm received RDP support for investments in productive assets or not. This formulation of the treatment variable is narrow and shows whether support for productive investments had an impact on the outcome variable. If a wider evaluation perspective is adopted, the treatment can be formulated as whether the farm received any RDP support or not. The outcome can be formulated as a continuous variable, e.g., the weighted average age of machinery, or as a binary variable, e.g., a specific type of innovation occurred or not. FLINT also used the definition of 'farms investors', which are the farms with an average age of machinery of less than six years or as 'non-investors' when farms do not show significant investment in the past six years. The treatment variable (RDP founding or not) is provided by IACS. The outcome variables should be collected by the evaluator following the FLINT definitions, the [FLINT Farm Return](#) and the proposed data collection processes as detailed by FLINT. The FADN variables will be used for matching beneficiaries with no-beneficiaries.

<sup>2</sup> See also Helpdesk Guidelines 'Assessing RDP achievements and impact in 2019', PARTII, Chapter 2.2.3, which provide a quick guide on PSM-DiD.

Therefore, RDP evaluators will need to take subsidies into account, using time series (i.e., data over a number of years), in order to distinguish between investors (i.e., those who receive RD support for investment, therefore, the average age of machinery is less than six years) and non-investors (i.e. do not receive RD support) and assess the effects of subsidies on the different variables. The time series data on investors (supported farms) and non-investors (non-supported farms) would be collected by evaluators from FADN.

The proposed steps in the PSM are described below.

### **Steps for applying PSM**

**Step 1:** Calculation of individual propensity scores. The propensity scores for each observation in the supported farmers and the non-supported farmers are econometrically estimated using the predicted values from a standard logit-model. The list of variables selected as covariates to estimate the logit function are: country, type of farming, total standard output.

**Step 2:** Exclusion of non-similar farms from the control group. Some of the supported farms and non-supported farm units can be excluded from further comparisons because their propensity scores would be outside the range calculated for supported investors units. Out of several alternative matching algorithms, radius matching can be used. This method can be considered as a variation of the nearest neighbour method. By using radius matching, bad matches can be avoided by imposing a tolerance level on the maximum propensity score distance.

**Step 3:** Calculation of relevant result indicators. The mean values of the result indicator for comparable supported and control units are computed using the matching algorithm.

**Step 4:** Calculation of the most important policy parameter, namely the Average Treatment Effect (ATT) on treated. The ATT measures the difference in mean (average) outcomes between farms in the treatment group and farms in the control group.

**Step 5:** Estimation of the effect of age of machinery.

The sample farms can be very heterogeneous in terms of farming activity and the quantity of fixed assets. In order to eliminate the possibility that small farms (with low amount of fixed assets) influence the results significantly, total assets per farm (FADN code SE441) can be applied as weight.

For the innovation indicator, farmers who received RDP support for investment would be asked to answer some survey questions as in the example of questions provided below. The questions are adapted from the Community Innovation Survey to the agricultural context.

### **Example of questions for conducting a survey to farmers on innovation**

#### For process innovation:

- During years xxx to xxx and as a result of RDP support, did you farm produce:
  - 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.

For product innovation:

- During years xxx to xxx and as a result of RDP support, did you farm produce:
  - New or significantly improved goods (*exclude the simple resale of new goods and changes of a solely aesthetic nature*)
  - New or significantly improved services

For market innovation:

- During years xxx to xxx and as a result of RDP support, did you farm produce:
  - Significant changes to the organisational management of the farm
  - New methods for product placement or sales channels (*i.e. direct selling, exclusive retailing, new concepts for product presentation*).

**Step 4: Analysis of findings**

The results would show, on one hand, the extent to which RDP support for investments in modernisation specifically, or RDP support in general, has contributed to improve the economic performance of farms in terms of reducing the age of assets and, on the other hand, the extent to which these investments have produced various types of innovation. Modernisation and innovation are key drivers for competitiveness and improved economic performance of farms.

To further analyse the indicator results, it is recommended to carry out also qualitative analysis through focus groups with beneficiaries of support. This will help triangulate the findings stemming from the values of the above additional results indicators.

**Further reading**

Farm level indicators for evaluating sustainability and emerging new policy topics: [https://www.flint-fp7.eu/downloads/reports/FLINT%20WP1\\_%20D1%204.pdf](https://www.flint-fp7.eu/downloads/reports/FLINT%20WP1_%20D1%204.pdf). Authors: Edel Kelly, Mary Ryan, John Finn, Thia Hennessy Teagasc, Ireland

The state of innovation in European agriculture: Innovators are few and far between: [https://www.researchgate.net/publication/312966647\\_The\\_state\\_of\\_innovation\\_in\\_European\\_agriculture\\_Innovators\\_are\\_few\\_and\\_far\\_between](https://www.researchgate.net/publication/312966647_The_state_of_innovation_in_European_agriculture_Innovators_are_few_and_far_between). Authors: Harold van der Meulen, Marcel A.P.M. Van Asseldonk, Wageningen University & Research

Effect of age of assets on farm profitability and labour productivity: <https://www.flint-fp7.eu/downloads/reports/D5.2f.pdf>. Authors: Eszter Kis Csatori, Szilárd Keszthely

Innovation and performance - evidence at micro level: [https://www.researchgate.net/publication/332059853\\_Innovation\\_and\\_performance\\_-\\_evidence\\_at\\_micro\\_level](https://www.researchgate.net/publication/332059853_Innovation_and_performance_-_evidence_at_micro_level). Author: Johannes Sauer, Hans Vrolijk, Wageningen University & Research

Farm Return Data Definitions for FLINT: [https://www.flint-fp7.eu/downloads/reports/FLINT\\_data\\_definition.pdf](https://www.flint-fp7.eu/downloads/reports/FLINT_data_definition.pdf), July 2015

The Measurement of Scientific, Technological and Innovation Activities. Oslo Manual 2018: Guidelines for collecting, reporting and using data on innovation: <https://www.oecd-ilibrary.org/docserver/9789264304604-en.pdf?expires=1639755927&id=id&accname=quest&checksum=78C9EBE0E118BA6EFAE48366DFC03D87>