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Evaluating Rural Development Programmes Using FADN Data

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FOREWORD

The new Rural Development Regulation¹, for the 2007-2013 programming period, presents a simpler approach to rural development than the previous one, but at the same time more strategic, by establishing three main objectives to be applied to all rural development measures (competitiveness, environment, quality of life). The main innovation is the introduction of the so-called strategic approach, which also involves a new orientation in terms of monitoring and evaluation. In fact, there is an increasing need to create a system of monitoring and evaluation based on common principles and procedures, to meet the needs of information relating to the effects of rural development policy (Monteleone 2005; Mantino, 2008). To this end, the European Commission together with Member States, presented the Common Monitoring and Evaluation Framework (CMEF). The existing procedures for monitoring, supervision and evaluation have thus been extended and strengthened to ensure more effective use. These improvements reflect a more decentralized approach to planning and programme management and a clearer definition of responsibilities for monitoring and evaluation at the Community, national and regional levels.

In this context, a source of economic statistics to support programming in the agricultural sector is of particular value (Scardera, 2008). The Farm Accountancy Data Network (FADN) collects information on income and economic performance of farms in the European Union and can meet the demands of programming and evaluation of public administrations of Rural Development Programmes (European Commission, 2002). The FADN is a sample survey made annually, carried out with a uniform methodology at the EU level; since 2003 the sample has been selected randomly, in full compliance with the requirements of statistical representativeness². This source, as well serving as a base of knowledge for evaluation surveys or scientific research, has already been used in ex-post evaluation of CSF 1994-99 in the regions concerned, in evaluating the EU Regulations N. 2078/92 and N. 950/97 (Gatto, Monteleone 1998), as well as defining the Rural Development Plans and Regional Operational Programmes (part of EAGGF) for the 2000-2006 programming period and in providing information for the Rural Development Programmes (ex ante) in the current programming phase.

¹ EC Reg No 1698/2005.

² In order to reduce organizational and financial burdens imposed on institutions of Sistan and the statistical burden on respondents, by avoiding duplication of requests for information on similar phenomena, since 2003, Istat, INEA and the regions have signed, with the approval of State-Regional Conference, a "Protocol of Intent to carry out an annual survey on economic performance of farms" which provides for REA FADN surveys to be conducted in a coordinated manner. It is worth noting that the FADN also falls within the National Statistical Programme 2007-2009 (FADN - cod. PSN INE-00001).

PREFACE

Over the years, as a result of the changing role of agriculture and the evolution of Common Agricultural Policy, partial changes have been made in the objectives of FADN, which was set up specifically to gather accounting data to enable economic analysis of farms. Today, the objectives of the FADN are far more diversified and the availability of information gathered allows the fulfilment of new purposes: from monitoring the evolution of farmers' income, to development, updating and evaluation of agricultural policies.

It is interesting, in particular, to emphasize the FADN information system's response to increased need for evaluation of Community agricultural policy measures, especially policies for rural development. Clearly, the European Commission attaches great importance to evaluation, seen as a learning process and not as a mere formality. Evaluation thus becomes a knowledge tool that can improve implementation of measures and thus achieve identified objectives.

This work is dedicated to the presentation of the possible uses of the FADN, with a view to the evaluation of rural development. The project will first retrace the steps that made the FADN a strong source of information relevant to evaluation activities, and also proposes and describes the current possibilities for use in evaluation paths that can be implemented through constant monitoring. The work consists of several parts, which deal with different aspects of the use of FADN.

The first part focuses on the FADN's evolution over the years, in order to meet the needs of evaluators and to assume more and more characteristics that meet their needs for knowledge and methodology. From this point of view, the most important elements have been revisions to the sample system and the mode of selection, the establishment of the "FADN Evaluation Archive", and the establishment of the "FADN-INEA package", following the introduction of new data gathering methodology, translated into GAIA software.

The second chapter examines the potential uses of RICA is an important tool for programming and evaluation. The more marked use of the so-called strategic approach, in fact, provides a closer, more motivated relationship between the choice of measures, the determination of objectives and the opening framework, namely the context. Equally important is the reading of context, as benchmarks for evaluation activities to isolate the effects of a programme net of dynamics that characterize the whole territory. The chapter provides a more general description and specific indications, also regarding the baseline indicators proposed at the Community level. In the definition of context, a specific theme concerns the precise parameters of farm profitability, leading to some summary indications about the possibility of creating indicators to analyse farms' competitiveness.

Again in relation to the problem of estimation of the indicators used in evaluation processes, the third part of the work explores the opportunities offered by FADN in the

quantification of specific information by measure and axis. The chapter will provide insights on the indicator of results for estimating the increase in value-added for beneficiaries and in relation to three specific measures within the RDPs.

The fourth part examines a very specific theme, namely the economic justification of the supports disbursed for rural development, especially measures in Axis II. The compensatory nature of these measures, in fact, requires an accurate analysis, which allows estimation of the correct level of support to be disbursed. The basic principle is that adherence to support schemes with strong environmental characteristics leads to a decrease in revenues and higher costs. The resulting differential should lead to proper quantification of the subsidy.

The last part of the work is designed to highlight the potential use of FADN in very specific evaluation techniques concerning estimates of impacts: the counterfactual approach. The chapter consists of a first part, which provides a framework for comparison techniques, while the subsequent parts are designed to provide more detailed information on the statistical methods used in rural development and guidance for building so-called satellite samples.

1 The evolution of the FADN toward uses for evaluation

The Farm Accountancy Data Network - FADN - is considered by the European Commission to be the main information system to support the development of the Common Agricultural Policy (European Commission, 2002). It was designed as a tool for detecting annual incomes of farms covered by the EU agricultural policy and to analyze their farm operation; it can also be used to monitor the evolution of farm income (in general or in specific regions or for certain types of production) but also for sector analysis at different levels (European, national, regional). The FADN, then, is the primary source of data, cited in relevant documents, for programming and evaluation of EU agricultural policies and, therefore, also those of rural development (Abitabile, Scardera, 2008).

It is on this basis that INEA has made a farm plan aimed to give the Italian data network characteristics of a *“socio-economic information system for Italian agriculture”*, which was ratified by the National FADN Committee on April 4, 2007. In this way, the FADN is not implemented only to respond specifically to the needs of the European Union, but also as a primary information source and as the exclusive national socio-economic data base at farm level, to describe the national production system. The cognitive needs arising from new development scenarios outlined by agricultural policy measures in 2013, in fact, require that regional governments have meaningful information, at least on a regional level, about the technical and economic evolution of farms, for purposes of evaluation and planning of interventions in the agricultural sector.

FADN was therefore assigned to an ever more complex task, thanks in part to the introduction of methodological innovations which have affected the sample design and instrument for collecting information and which have led to a better statistical representation of the regional agricultural systems, in a farm information framework that takes account of the new model of agricultural enterprise (multi-functionality, environment, jobs, participating in agricultural schemes, etc.).

A first important innovative aspect of this plan is the revision of sample design and selection procedures for the survey units. Until 2002, in fact, the survey was based on voluntary participation of farms in the Network, but now the sample is random, constructed on the basis of a sample design that ensures the statistical properties of representativeness. By adopting a random selection sample through the FADN data will continue to be gathered that will satisfy the information needs of the European Union, in compliance with Regulation (EEC) No 79/65 of the Council and subsequent amendments, but also those of ISTAT, which makes its own annual statistical survey on the economic performance of farms, known as REA (PSN code IST-00191), for the system economic accounts for agriculture (EC Regulation 2223/96) and that of the family farm income (code PSN IST-00585). The FADN is therefore incorporated more

fully into the National Statistical Programme, among statistics of public interest (code INE PSN-00001).

The scenario of agricultural policy, outlined in the National Strategic Plan (NSP) and the Regional Rural Development Programmes (RDP) 2007-2013, assigned strategic importance to analysis of farms' behaviour, monitoring and evaluation of impact, compared to the past, as already mentioned. The CMEF proposes questions that are not always easy to answer due to lack of appropriate sources of information. Often both primary and secondary data are required: the FADN Data Bank ranks among the sources of secondary data, as part of the list of official sources together with data from ISTAT. The suggested use of accountancy network data is to provide a description of the socio-economic environment in which the Programme is implemented, highlighting the effects and consequences of the policies contained therein.

The FADN Data Bank is the only harmonized data archive on farms that covers the entire European Union, and thus allows a comparative analysis at the European level. It contains about 2,000 elementary pieces of structural, accounting and non-accounting information for each farm in the network and for each fiscal year. The national sample consists of about 12,000 farms beginning with the accounting year 2008 (until 2007 it included 17,000 farms), reviewed in the light of new data from the survey on farm structure. The recent reorganization of the data network in Italy led to the creation of a Data Bank organized according to a main relational database (economic-management and structural information useful for the preparation of the farm budget) and a number of specific databases which allow in-depth examination at the micro-data level: for each farm, in fact, cost and production can be analysed for each individual farm activity, CAP contributions, labour and other revenue (such as agri-tourism).

Because the database contains a significant amount of information at the farm level, it becomes a useful tool for all those measures and sub-measures that have identified farms as beneficiaries of measures. In recent years, INEA has made a significant effort to adapt the FADN's information potential to the needs of evaluating rural development measures and, more generally, of policies benefiting farms. In particular, the process of validating the information collected has been improved, in order to ensure better quality and reliability.

The project dates back to 2001 (INEA, 2003) for the establishment of a "FADN Evaluation Archive" by which to exploit the information potential offered by FADN and provide regional administrations with a useful tool for evaluating agricultural policies. The structure of the Archive consists of a specific Microsoft Access® data base consisting of a set of information tables related to a series of look up tables which fit a specific framework. Data collected through the FADN, properly checked and validated, are also made available, on the basis of stipulated agreements/conventions, to the individual regions and autonomous provinces, as members of Sistan, in the form of databases. From this one can draw useful information not only to define the framework within which agricultural policy and rural development measures are implemented, but

also to compare the situation of the farms that benefit from the intervention with those that do not.

In the light of experience made, the reorganization of the Italian accountancy network has been guided to consolidate and expand within INEA, in agreement with ISTAT, the integration and harmonization of the FADN with other sources of statistical and administrative information sources related to the implementation of agricultural policies. There has therefore been an increasing utilization of data from the FADN, both to supplement ISTAT information, and as decision support for the ex-ante and ex-post evaluation of the impact of policies for the sector. In addition, information was used in national and international research (EU, OECD, FAO) for cognitive analysis and to build simulation models that support the processes of planning and evaluation of development policies.

It is to meet these cognitive needs that INEA provides the Regions and Autonomous Provinces a so-called “FADN-INEA package”, as the result of accounting surveys. In detail, INEA offers to supply, free of charge, FADN micro-data, for the geographical area of reference, together with uniform procedures and processes coordinated at the national level. The services include:

1. an information framework which incorporates the existing regional database and FADN Evaluation Archive, which from the accounting year 2008 will be available through the GAIA DataWarehouse;

2. a selection of information to support management. The GAIA DWH will provide farm information functional to the disbursement of assistance to farm management (technical and economic results for production orders, production costs, etc.). The obligation remains not to release data of individual farms, but only aggregated data from at least five observations;

3. the accounting survey instruments (GAIA) and the EU classification of farms (Class), together with technical support training, useful in the application of rural development measures;

4. collaboration in planning and participation in terms of skills in setting up regional programs, designed for agricultural technicians and related to farm consulting.

INEA guarantees methodological uniformity in the definition of products and services that will allow full comparability of results among various geographical areas.

2 FADN for the context description and needs assessment

The FADN can be used for the important task of context description (ex-ante evaluation, AER annual reports, mid-term evaluation, ex-post evaluation). In this sense it is possible to draw a wide range of useable indicators and indices, from structural ones (e.g. the intensity of land and labour inputs) to economic (e.g., labour productivity, the impact of government support, etc.). This information, remember, is particularly relevant to the technical specifications for scenario analysis, such as, for example, SWOT and Logycal Framework matrices. In parallel, the information derived from the archives are widely used for the analysis of territorial, with details of reference and benchmarks (district, province, municipalities, mountain communities, disadvantaged area, rural area, an area with low environmental impact, altitude, Leader area, etc.). In fact, farm information can be related to the sub-samples of farms located in those particular areas, because the information is present in the database or can be obtained through simple calculations.

This type of analysis, however, requires some care/caution. In fact, there are some important elements which must be taken into consideration, both for the setup steps of the analysis and during data interpretation. In particular, we highlight some critical issues of particular relevance.

- **The representativeness of the sample design.** The sample design, in accordance with Community provisions, guarantees statistical representativeness at the regional level. Therefore, the results obtained for lower territorial levels (rural areas, disadvantaged areas, areas with high environmental impact) should be carefully evaluated. In some cases, one may need to proceed with a weighting of the data (based on specific criteria such as, for example, the geographical location of the farm, the type, size, etc.), or establish stratification criteria other than basic ones, or even place special emphasis on the identification and treatment of *outlier*³ observations (farms).

- **The rotation of farms** in the sample. The sample design is achieved with the rotating panel technique, which provides that a portion of the sample is periodically updated (every 4-5 years, with annual renewal of 20-25% of the survey units). This could lead to a discontinuity in observations.

- **Updates and changes.** The survey is characterized by periodic reviews and improvements in the structure and information content. The review and updating of procedures for checking and correcting data are performed at each survey cycle. The monitoring of changes introduced in the database (in terms of information/variables) is important both for analysis of repeated comparisons over time or in the case of historic

³ Further details about reliability of estimates made from FADN data can be found in the methodological nFT “The FADN sample: methodology for weighting calculation and analysis of the reliability of estimates”, at http://www.rica.inea.it/public/it/ponderazione_risultati.php.

series (checking the same information set).

- **Missing information.** The survey stems from the requirements of accounting records and therefore the information collected is not directly targeted for analysis and evaluation. However, over the years much new information has been gathered, even of a more descriptive nature.

It is therefore considered necessary that, from time to time, depending on the goal, there be a deeper scrutiny of the results obtained. The processing of FADN data remains a sensitive issue and only a deep knowledge of the instrument can provide a good degree of reliability.

In particular, as regards the possibility of providing context information, it may be useful to proceed by identifying a *constant sample of farms*, extracted from the “FADN Evaluation Archive”, to be monitored over time. This procedure may allow observation of behaviour of farms in multiple accounting periods in the medium to long-term. The sub-sample should include a number of farms that benefit from public support. Another possible application could be in the analysis of case histories or specific uniform clusters of farms. These methods are interesting both for trend analysis, and for benchmark techniques.

2.1 Context indicators: economic information at the farm level

In the process of contextual analysis to determine the needs required to approach the RDP 2007-13, the regions were asked to provide an point-by-point diagnosis of the agricultural sector, with a final SWOT analysis from the information collected, including by sector and territory (RDP Area). In many cases, the FADN database was used, along with other information sources such as ISTAT and ISMEA, to provide information to that effect, especially about farms’ characteristics. In an aggregated way, some specific uses can be highlighted.

- ✧ analysis of economic performance;
- ✧ analysis of effects of changes in policies for agriculture;
- ✧ analysis of scenarios and impact.

Analysis of economic performance. Establishing a specific contextual analysis of the various regional supply chains calls for an indication of the strengths and weaknesses of individual farm categories. In order to highlight the economic parameters of farms operating in the area, some regions have used FADN data to provide estimates on the farm performance and costs of production. In general, analyses have used ad hoc calculations, both parametric and analytical, but in other cases the observation was focused exclusively on the estimation of Standard Gross

Margin⁴.

The information most commonly used to describe farms' performance is that relating to items of income (net, gross and family labour), sometimes also in comparisons, using as a benchmark the national datum and developing estimates on data from the FADN. In some cases, analysis shows only the information already compiled, for both active and passive budget items, but in other cases, specific calculations were made, for example using the distinction between explicit farm costs (specific costs, mechanization, overheads, depreciation and amortization) and opportunity costs for land and agricultural capital.

With regard to the estimated costs of production, analytical accounting models are applied which, by subtraction (redeployments within the sector, specific costs, internal and external capital, the value of bi-products), arrive at the estimate of costs, starting from the gross output. In these cases, the estimation of some elements is made parametrically (including depreciation of fixed assets, value of capital and outside labour, the remuneration of farm capital and family labour), by allocating overhead costs according to the processes' share of revenue.

The survey of economic information through the FADN was also used to determine a kind of marginality index, based on classification by size unit (ESU). The impact, in fact, of lower classes and those considered non-professional (<4 ESU) of the total of regional farms can provide a proxy of the real market propensity of the regional system. A strong presence of farms in with less than 4 ESU shows, in fact, a high share of farms that may be regarded as marginal and whose products are mostly intended for own consumption.

Analysis of effects of changes in agriculture policies. Within the analysis of the role of the agri-industrial system, some regions have proposed in-depth studies relating to future and likely impacts of reforms, which, from the mid-2000s, have affected the CAP, in particular with reference to the so-called Fischler Reform. Evaluation of changes in the sector before and after this reform, and the changes the reform itself may have on farm organization, are key factors in delineating the overall scenario of agriculture in the current programming period. Impacts were estimated both from the standpoints of production and income, using simulation models at the sector level.

The simulations conducted are based on FADN data collected during accounting period 2000-02 to determine the single farm payment, and refer to the methodology

⁴ Standard Gross Margin (SGM) is the difference between the standard production value and the standard amount of certain specific costs of planting and livestock. SGMs are determined by individual farming activity and for each region, as the average situation (standard, in fact). SGMs are determined for the purposes of applying Community typology for the classification of farms, according to Commission Decision No 377, June 7, 1985, as amended.

proposed by a special study carried out by INEA (Povellato and Velasquez, 2005). This approach provides a sensitivity analysis based on comparing the pre-reform situation, with some different hypotheses of implementation, in a *ceteris paribus* context⁵. The parameters used for analysis are economic and structural, while the outcome variables are the estimated gross margin and the impact of subsidies on the same gross margin.

In other cases, the regions commissioned INEA to conduct more precise and specific research as to the impact of the Fischler Reform. The impact analysis on the allocation of crop land and income of farmers was made using a mathematical model, based on the methodology of positive mathematical programming and built using information derived from the AGEA database and the FADN. The scenarios identified, and compared with the baseline reference, were grouped in two main schemes: decoupling and partial decoupling of direct payments for arable crops.

Scenario analysis and impact. The activities of estimation and evaluation of possible impacts of 2007-13 RDPs represent a point of marked importance. The methods used were different and in many cases have produced mixed performance among the different regions (Cagliero *et al.*, 2009). In some cases, the methodologies referred to the definition of scenarios of context, as basic knowledge on which to make projection estimates. In these situations, the regions, or the evaluators, have often made use of FADN data both in relation to the wider regional context and in relation, and more specifically to the beneficiaries of past programming.

For example, in the case of quantification, in the ex-ante evaluation of changes in value added in the sector, estimation was made on the capital-product ratio, derived from estimates based on farm information. This relationship was used as a proxy of the average marginal capital-product ratio of regional farms. In the case of change in employment (jobs created), a rough estimate was produced, using the value added and the parameters of the GVA/AWU ratio, beginning with the data in the FADN sample.

Other approaches have used as the basic parameter the estimate of an indicator of margin of growth in income farm, which can be achieved by effectively adopting measures proposed in the RDP. Where it is impossible to determine a priori the types of beneficiary farms, that margin has been calculated within homogeneous groups of farms by FT and ESU, as the difference between the median (reference condition) and third quartiles (good practice). Again the data used come from the FADN; a coefficient of "effectiveness" was then estimated for each intervention measure.

2.2 Baseline indicators: labour productivity in agriculture

The key instrument in the planning phases and, subsequently, of evaluation is the

⁵ Commission Decision No 377, June 1985, as amended.

so-called “intervention logic” that establishes the causal linkage between the reference context, objectives, resources, products (output), results and impacts. Intervention logic starts with an analysis designed to identify the needs to which the programme should respond. In this sense, the baseline indicators are the instrument for analysing the initial situation in order to highlight strengths and weaknesses. Baseline indicators are divided by the Commission’s guidelines into:

- objectives-related indicators, whose performance could be affected by the rural development policy;
- indicators of context, which are not expected to change in the short to medium term, or that may depend on exogenous factors.

The indications on the use of baseline indicators are specifically listed in the documents that make up the Common Framework for Monitoring and Evaluation (European Commission, 2007) and, more specifically, in the Guideline note G - *Baseline indicators fiches*. The NRN has provided a summary and guidelines on the specific availability of the necessary information to estimate the various indicators (Rural Network, 2010).

Within the battery of indicators related to objectives, indicator number 6 on competitiveness is intended to measure trends in labour productivity, using the ratio of value added to work units. The NRN document proposes a number of secondary sources, such as ISTAT and the INEA yearbook, to find aggregated information at the regional level. However, the fiche prepared by the Commission also requires estimation of productivity by production orientation (FT or Farm Type, according to the FADN description). In this case the indication is to go directly to the FADN database, using the measurement of VA and the field SE410 - Gross Farm Income.

Diagram 2.1 – Fiche describing baseline indicator 6 regarding objectives

AXIS 1	COMPETITIVENESS
	6 – Labour productivity in agriculture
Status	Lead indicator
Measurement	Value added per work unit (VA/UL ÷ GVA/AWU) GVA understood at basic prices and current values. The ratio is to be expressed as an average figure over three years, to mitigate trend aspects.
Definition	GVA: the difference between value of production of goods and services achieved by individual production branches and the value of intermediate goods and services consumed on-farm. In this case, value at basic prices is used. AWU (FTE): represents the amount of labour performed by a full-time worker.
Sub-indicators	FT (Types of Farms -Commission Decision 85/377/EEC; http://ec.europa.eu/agriculture/rca/index.cfm) Farms specialising in arable crops (TF1) Farms specialising in flowers and ornamentals (TF2) Farms specialising in permanent crops (TF3) Farms specialising in herbivorous livestock (TF4) Farms specialising in granivorous livestock (TF5)
Unit of	GVA/AWU expressed in thousand euro

measurement	
Available sources	<p>Source 1: Eurostat</p> <p>Source 2: ISTAT - regional economic accounts:</p> <p>Source 3: UnionCamere – Atlante competitività delle Province italiane (Competitiveness in Italian Provinces - file xls downloadable)</p> <p>Source 4: INEA – Annuario dell'agricoltura italiana (Italian agriculture yearbook - volume with CD)</p> <p>For sub indicators - Source S1: FADN: DG AGRI Europa – agriculture - FADN - standard results - public database – income indicators. http://ec.europa.eu/agriculture/rica/index.cfm</p>
Issue period	Annual
NFTs	At sector level, measurement of GVA is estimated from Gross Farm Income (SE410).

Source: NRN, Notes on baseline indicators related to objectives.

2.3 The FADN for the parameterization of farm profitability

The Common Agricultural Policy, in the course of its evolution, has increasingly pursued the objective of improving competitiveness in the agricultural sector to cope with the progressive reduction of protections to farms from the public administration (evolution of the rules of international markets, trade liberalization, decoupling of EU aid, etc...)

A good indicator of management competitiveness is definitely the parameter of farm profitability, which is believed capable of revealing, through study of its components, some inefficiencies and weaknesses of the agricultural production sector.

This has been achieved, beginning from technical and economic information about farms collected through the FADN accountancy data network (with data collected in 2007⁶), processed on the basis of a specific methodology developed by the Centre for training in economics and rural development policy, Portici, in collaboration with INEA⁷.

The objective of analysis is the evaluation of real net farm income (NI), both overall and as unitary remuneration of the individual inputs used, by comparison with net income of Reference (NIR), a standard value obtained from the sum of the payments for its component inputs (land, capital and labour), in turn calculated taking account of realistically feasible alternative employment opportunities.

The unit values of remuneration of the factors were used to calculate:

- Net income of Reference (NIR) of farms, which can be defined as the total

⁶ For 2007, the criteria adopted for calculating the remuneration of factors were established: 9 €/h for household work, 3.6% for working capital and 1.7% for land capital.

⁷ D. Tosco, Profitability and Production Costs on Specialized Farms at www.rica.inea.it

remuneration of inputs given the amounts used and the set levels of unitary remuneration;

- Net income of Reference (NIR) reported an average group of farms;
- The Profitability Index (PI) which is obtained from the relationship between NI and NIR; for classification of farms four classes of profitability have been established:
 - IR1 con $IR < 0,33$ Low profitability
 - IR2 con $0,33 \leq IR < 0,66$ Low-to-average profitability
 - IR3 con $0,66 \leq IR < 1$ High-to-average profitability
 - IR4 con $IR \geq 1$ High profitability

In a nutshell, the methodology developed provides for the verification of profitability with the construction of homogeneous groups of farms whose financial results (NI) are compared to the profitability of reference (NIR) to calculate the profitability index (PI).

For a better understanding of agricultural situations, not only for the purposes of agricultural policy, but also from the standpoint of agricultural consulting, it is useful to evaluate the profitability of farms and inputs in relation to structural conditions and farm organization, as well as in relation to production types practiced.

In this perspective, the analysis of data requires their decomposition according to economic size (a variable that appears as the most significant, since the efficiency of the farm often turns out to be directly related to economic size) and farms' physical size, as well as their geographical location and production type, expressed by farm type (FT). In addition, profit results can also be analysed in relation to their breakdown (cost-income items), and in particular the role played by public support in defining them.

3 The FADN for specific indicators of measure and axis

The strategic approach to rural development has greatly increased the need to create a system of monitoring and evaluation based on common indicators (Monteleone, 2005). To this end, fulfilling the requirements of Regulation (EC) No 1698/2005, the European Commission together with Member States presented the Common Monitoring and Evaluation Framework (CMEF), which provides tools for setting up a system capable of ensuring uniformity in the processes of monitoring and evaluation. In this context, the Commission proposed a set of common indicators used to describe baseline situation, financial execution, products, results and impact of the programs.

Using intervention logic, as described in the previous section, we see the links between financial resources, products and results of measurements, to arrive in an aggregated way at the impacts of the Program. The logic of intervention in terms of programming sees a "hierarchy of objectives" which breaks down the overall objectives into operational objectives; in terms of evaluation, such an organization calls for a hierarchy of indicators. The indicators contained within the CMEF⁸ are divided into different types and information functions (Cagliero and Pierangeli, 2009; Cagliero et al. 2009).

Diagram 3.1 – Example of articulation and use of indicators for RDPs 2007-13

Type	Description	Example	Use	Level
Resource	Financial resources, or other, assigned to each level of measure	Public funding; EAFRD quota	Resource allocating and financial progress analysis	Measure and aggregate by axis and RDP
Product	Activity completed directly	N. of beneficiaries; investments activated	Physical progress analysis	Measure
Result	Direct and immediate effects of measure	Increase in value added to beneficiaries	Observation of net changes to beneficiaries	Measure and aggregate of multiple measures
Impact	Benefits of program, more generally in the area of the RDP	Increase in labour productivity	Impact analysis (net) of policy on the territory	Program
Baseline		Labour productivity	Analysis of context and observation of trend	Territory or RDP area

Source: Cagliero and Pierangeli, 2009

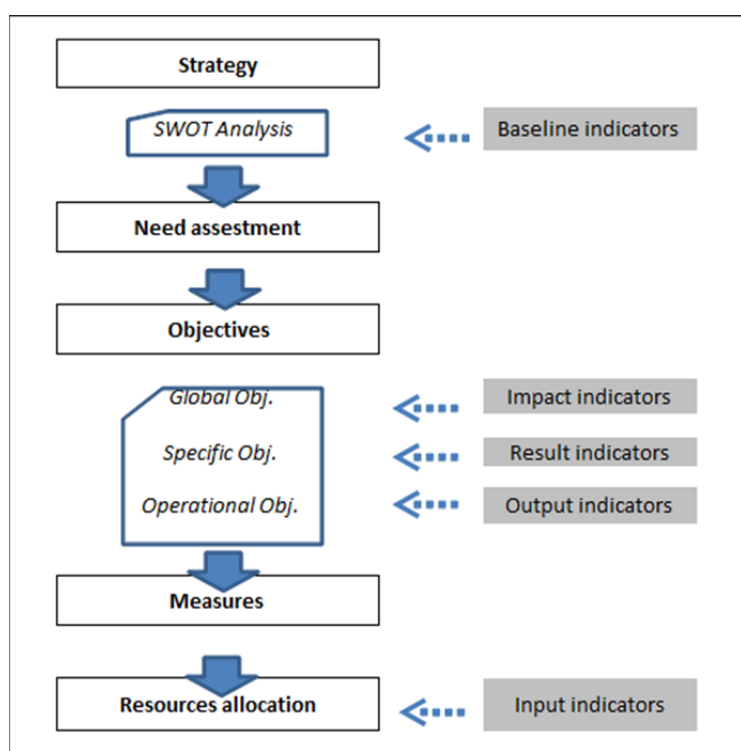
Along the causal chain, the hierarchy of indicators begins with financial inputs,

⁸ Guidance note A-Choice and use of indicators; Guidance note F - Common indicator list.

which will generate outputs, i.e. the products of interventions in the physical or financial sense, in pursuit of operational objectives directly related to the measures. The results that may arise are the immediate and gross effects of interventions and should contribute to the achievement of specific objectives, also aggregated at the level of axis or sub-axis of action. Impacts should eventually help achieve the general objectives of the programme and must relate to the needs identified in the diagnosis phase.

The indicators are tools to evaluate, at every level (product, outcome, impact), the degree of achievement of the objectives researched either through individual measures or application by axis or for the entire program.

Figure 3.1 - The logic of intervention framework and related indicators according to the CMEF



Source: INEA

3.1 Quantification of performance indicators

An important point of the EU guidelines on the evaluation of rural development is the identification and quantification of results. Performance indicators are designed to estimate the effects, however gross, directly to beneficiaries of interventions or of series of interventions related to each other and aimed at common objectives; in many cases, the performance indicator is considered as an indication at the axis level of the

RDP. In this sense, the CMEF offers a limited battery of indicators (only twelve) and indicates what measurements are involved in the calculation.

The estimate of results has two distinctive features. The first concerns the collection of data, which in theory should be done directly on all beneficiaries. In this sense, performance indicators are used for both evaluation and monitoring, obviously generating confusion. The second aspect is that the result provides an estimate only of gross change, not net, as happens in the case of impact; in this sense, it does not provide a precise indication of the effect of the intervention alone.

In some cases it is possible to evaluate the baseline situation and the result, at least in terms of support beneficiaries, but it is often difficult to contextualize the information in relation to broader trends. This may depend on small scale intervention or lack of appropriate baseline data. For this reason the EU guidelines suggest that, as for impact, the result be evaluated from the bottom up, in an additive manner, among the beneficiaries and then among interventions.

Note I in the CMEF for performance indicators presents and describes in detail the twelve orientation fiches; as with the baseline indicators, here too evidence is provided about the nature of the indicators, measurement, details, the presence of sub-indicators, and especially on the usable sources of information. In the case of indicators for Competitiveness Axis R2 (Increase in gross value added for holdings supported), R4 (value of quality agricultural production) and Axis III R7 (Increase in non-agricultural value added in farms supported), the guidance note indicates among the few possible sources, in addition to the direct survey of the beneficiaries themselves, the FADN, for its characteristics and its representativeness.

Diagram 3.2 - Fiche of indicator R2 – Increase in Value Added to beneficiary farms

AXIS 1	COMPETITIVENESS
R2	Increase in Value Added for supported farms
Measures	112-113 -114-115-121-122-123-124-125-131
Measurement	$(\sum \text{outputs} - \sum \text{intermediate consumption}) / \text{num. farms supported}$
Definition	<p>The indicator measures the growth in gross VA for agricultural, agri-food and forestry beneficiary holdings.</p> <p>VA = output - intermediate consumption intermediate consumption = direct inputs + general expenditures outputs = sales proceeds + remainder stock + own consumption</p>
Sub-indicators	By measure and by sector
Unit of measurement	Thousand euros
Available sources	FADN (Farm Accountancy Data Network) REA figures Direct surveys of beneficiaries
Publishing period	Yearly

Source: European Commission 2007 (revised)

Of particular interest in recent months is the comparison with the European Commission services regarding the indicator R2. However, note that there is no strict correspondence between the current definition of indicator 2 and the FADN information on “gross value added”. To solve the problem, the Commission has proposed a definition of value added in line with FADN methodology (European Commission, 2010). In this sense, one possibility, also discussed on the evaluation Helpdesk, would be the opportunity offered by FADN to use the surveys already made of potential recipients, to proceed in gathering data for monitoring investments on farms. Moreover, the FADN would also permit using satellite samples (cf Chapter 5.2) for gathering information relating to a comparison group, to address issues of evaluation.

$$\text{GVA} = \text{Total outputs (SE 131)} - \text{Total intermediate consumption (SE 275)}$$

In addition to the approach of calculating GrossValue Added, the open questions of major importance especially affect survey methods, regarding both subjects for survey and the moment in which to proceed.

Official documents refer to an individual survey of beneficiaries, but leaves open the possibility for Member States to choose their own methods. The use of samples may be accepted. It is the responsibility of Member States to ensure reliability and precision of the method used for establishing samples and estimation indicators (European Commission, 2010).

On the second point, concerning the frequency of collection of information, note I reports that the information should be collected at least in the mid-term and ex post evaluation. Note that the Value Added indicator is also valuable for monitoring, and there is thus a clear need to conduct frequent and timely surveys in relation to the real progress of the intervention. The main point is that the minimum number of measurements for each project is twice: upon application for support and on completion of the project. To measure real change in GVA, it is considered an acceptable practice to measure real change two years (n +2) after the completion of the project. In this regard, the Commission has recently made available a sample population schema of the results tables in the of Annual Execution Reports (Table R). In this example, shown in the chart below, it is clearly necessary, at least for purposes of monitoring, to estimate GVA starting at the time of application (A) and then provide a new indication, two years after completion of the intervention (C). This approach is considered a balanced compromise, because it minimizes the survey load, but it provides reliable data for monitoring and evaluation.

Diagram 3.3 – Schedule for surveying increases in VA on beneficiary holdings

	2007	2008	2009	2010	2011	2012	2013	2014
Holding A		A/C GVA 240		(n+2) GVA 250				
Holding B		A/C GVA 160		(n+2) GVA 155				
Holding C			A/C GVA 100		(n+2) GVA 150			
Holding D				A GVA 80	C		(n+2) GVA 120	
Sum of cumulative increase (Δ) of GVA	-	0	0	5	55	55	95	...

Source: European Commission, 2010.

3.2 Quantification of indicators by measure

The difficulties that arise when there are questions about the effects of rural development policies on income, employment and environment are, in general, articulated and complex. In this section, examples are given for proposals that could be adopted in cases involving an analysis at farm level. In particular, some indicators are presented using the FADN database for some RDP measures: 121, 112 and 211 (Cisilino, 2010).

FADN indicators for evaluating measure 121

In order to evaluate the productivity and profitability of the workforce, the Gross Income (GI) and Net Income (NI) are compared to land and labour inputs, respectively. The analysis of revenue considers Gross Saleable Production (GSP) per hectare of UAA to measure the productivity of the land, while the ratio in work units expresses the overall productivity of labour employed (economic efficiency per employee) or by hours worked (a variable also contained in the FADN database). Table 3.1 shows an example of use of GSP for analysis of product quality. In this case, it is also suggested to consider revenue from certified organic or quality production compared to total revenues.

The FADN database provides the value of aid received by the farm for the related investment measure and allows potential evaluation of impact of aid on income (NI).

It is also possible to calculate Operating Income (OI), which, in addition to generating Net Income, is one of the key budget variables for evaluating the farm's ability to produce income. It is obtained by subtracting costs related to labour and passive rents from Net Product (NP), and highlights the typical management of the farm, meaning strictly agricultural activities. In addition, it is a key component in some of the most widely used budget indices (ROI and ROS).

The degree of intensiveness of use of land and buildings may be useful to

understand the value of the farm's structural envelope, calculated as the ratio between UAA and AWU, while the measure of farm investments can be expressed as the value of agricultural capital invested per hectare of UAA or per employee.

The analysis of production costs can help evaluate farms' performance by comparing fixed costs and variable costs to UAA, farm revenues (GSP) or income (NI). The relationship between value added and gross saleable product shows the impact of variable costs on the farm's production. In addition, the FADN provides detailed entries on so-called specific costs by crop or livestock that could be used for a thorough evaluation of specific farm activities or product types.

Table 3.1 - Measure 121: FADN variables and indicators

<i>FADN Variables</i>	<i>FADN Indicators</i>
UAA (Utilised Agricultural Area)	GI/UAA
AWU (Total Work Units)	GI/AWU or GI/FWU
FWU (Family Work Unit)	NI/UAA
GI (Gross Income)	NI/AWU or NI/FWU
NI (Net Income)	GSP/UAA and GSP/AWU
NP (Net Product)	NP/UAA and NP/AWU
GSP (Gross Saleable Product)	GSP/Hours of labour
Organic GSP	GSP org/GSP (tot)
Ca (Subsidy for measure 121)	Ca/RN
RO (Operating Income)	RO/TWU
CF (Land Capital)	CF/UAA
CE (Working Capital)	CF/TWU
VA (Value Added)	CE/UAA
CoFi (Fixed Costs)	CE/TWU
CoVa (Variable Costs)	VA/GSP
CoTot (Total Costs)	CoTot/UAA (CoFi/UAA; CoVa/UAA)
	CoTot/GSP (CoFi/GSP; CoVa/GSP)
	CoTot/NI (CoFi/NI; CoVa/NI)

Source: INEA

FADN indicators for evaluating measure 112

The two groups that can be identified thanks to information provided by regional survey and analysis of structure and management in the FADN database are:

- A group of beneficiary farms in the young farmers' measure
- A group of non-beneficiary farms divided into two subgroups:
 1. non-beneficiary farms operated by young farmers
 2. other non-beneficiary farms

The second group is the counterfactual term in evaluating the effects of support for young farmers. It's also possible to consider a third group of holdings operated by older people, to evaluate possible differences between the old and the new generation towards innovation, the margins of productivity and entrepreneurial behaviour in general (Cisilino, Cesaro 2003).

Table 3.2 - Measure 112: FADN variables and indicators

<i>FADN variables</i>	<i>FADN indicators</i>
Farmer's year of birth	SWU/TWU
TWU (Total Work Units)	FWU/TWU
SWU (Salaried Work Unit)	Comparison between WU employed on beneficiary holdings and on non-beneficiary holdings or those not operated by young farmers
FWU (Family Work Unit)	Comparison between WU before and after signup for the measure
These indicators calculate for various comparison groups to obtain an indication of the best or worst performance for farms benefiting from the measure to set up young farmers	
Cb (setting up young farmers)	Cb/NI
ESU (European Size Unit)	Young beneficiaries by ESU classification
NI (New Investments)	NI/UAA
UAA (Utilised Agricultural Area)	NI/TWU
GI (Gross Income)	UAA/TWU
NI (Net Income)	GI/UAA
GSP (Gross Saleable Product)	GI/TWU or GI/FWU
	NI/UAA
	NI/TWU or NI/FWU
	NI/GSP
	GSP/UAA
	GSP/TWU
	GSP/Hours of Labour

Source: INEA

The FADN database allows us to know the value of the subsidies received by the farm operated by young farmers and to evaluate the impact of that contribution on income (NI).

Another factor to be considered for evaluation of employment is the size of farms run by young people. Observation should also be made of the structural adaptation of agricultural holdings after initial setting up, using the data for "new" farm investments, for groups under observation.

Table 3.2 then shows the same indicators already presented for measure 121 which are useful for an evaluation of farm performance if processed for the different groups under observation.

FADN indicators for evaluating measure 211

The measure of support for less-favoured areas and those with environmental constraints is designed to compensate disadvantage in income in these areas, but also to keep the rural community and the environment alive. The answer to evaluation questions mainly requires monitoring information, but again the FADN database may provide some indicators. First, it takes note of geographical location of farms, not only by province, municipality and altitude (plains, hills, mountains), but the FADN also shows if the farm is in less-favoured areas and whether there are environmental constraints. Particularly, less-favoured areas are classified as follows: non-disadvantaged, partially disadvantaged, totally disadvantaged and disadvantaged communities (EEC Dir.75/268 - Article 3 - par.4), partly disadvantaged (Dir.75/EEC 268 - Article 3 - par.5). With regard to environmental constraints the trend is: no environmental commitment, partial commitment to the environment, reduced commitment to the environment.

In evaluating measure 211 it is then possible to compare farms that are located in sensitive areas with farms located in areas not subject to special conditions and check the values of the indicators. In addition, it is useful for analysis to organize results by FT and ESU, so as to take into account the various types of production and farm size in order to highlight the incentive mechanisms that do not depend on actual natural disadvantages. Table 3.3 presents some key indicators that can be calculated to analyse this measure. In particular, it is possible to estimate the amount of aid per person employed and the degree of compensation for loss of income per worker. Some useful indicators are also confirmed for the evaluation of farms' performance, previously reported for the measures considered earlier in this paragraph and to which it refers (land and labour productivity (GSP/AA; GSP/TWO), intensity of use of labour (UAA/TWU), profitability of revenues (NI/GSP), profitability of labour (NI/TWU), etc..)

Table 3.3 - Measure 211: FADN variables and indicators

<i>FADN Variables</i>	<i>FADN Indicators</i>
CA (compensatory allowance)	CA/NI (gross of specific measure)
NI (net Income)	CA/NI (net of specific measure)
TE (Total expenditures)	Comparison between total farm costs in less-favoured areas (LFAs) and farms in non-LFAs
GSP (Gross Saleable Product)	Comparison between GSP on farms in LFAs and GSP on farms in non-LFAs
FT (Farm Type)	The following Indicators to be calculated by FT and ESU in order to reach information about the economic effect of the disadvantage
ESU (European Size Unit)	UAA/TWU
TWU (Total Work Units)	GSP/UAA
FWU (Family Work Unit)	GSP/TWU
UAA (Utilised Agricultural Area)	GSP/work hours
FC (Fixed Costs)	(FC+VC)/UAA
VC (Variable Costs)	GI/UAA
GI (Gross Income)	GI/TWU and GI/FWU
NI (Net Income)	NI/UAA
GSP (Gross Saleable Product)	NI/TWU and NI/FWU
	NI/GSP
	CA/TWU and CA/FWU

Source: INEA

4 FADN for the economic justification of subsidies for rural development

Information inferred - A further important role that information derived from the FADN can have is its use for the economic justification of subsidies for rural development that the regions must provide in accordance with the provisions of Articles 48 and 53 of the EC Regulation 1974/2005 of 15 December 2006. It should be recalled that the rule requires, in essence, the traceability of sources and checking the adequacy of the data for calculating the components required to set the subsidy⁹.

Farm accounting information collected and made available via the data network can easily be used for evaluating the adequacy of payments (Cesaro, 2007). The use of this data, already available and collected for other purposes, and for which it is not necessary to make specific operations of collection, is also convenient in consideration of the time required to make a specific survey of the fairness of subsidies for rural development and its complexity.

In this sense, the FADN can, even with the limitations described below, provide sufficient information for the evaluation of the adequacy of payments to many rural development measures. In particular, the FADN data base can be used to quantify the gross margins of the production process both in the baseline situation and, where relevant, in the situation of measuring compliance with commitments.

It should be said that, using FADN data, we must take into account the different situation with regard to compliance with baseline commitments between the 2000-2006 and current programming periods. Therefore, it will be carefully considered whether the data obtained from FADN fairly present the baseline situation.

The use of FADN data, as discussed below, can be achieved by using two different approaches:

1. comparison of partial budgets (gross margins of production processes - crops or livestock);
2. counterfactual analysis, with comparison of two farm balance sheets.

The difference between the two approaches is basically due to the fact that in the first case the measure is justified by using the technique of partial budget at the level of the production process, thus focusing only on the phases in the production process

⁹ Instructions for calculating subsidies are contained in Article 53 of implementation guidelines (EC Regulation No. 1794/06), which states: that calculations contain only verifiable elements; that calculations must be based on certain values properly gathered; sources of data must be clearly indicated; analysis must be differentiated by regional and local conditions and take into soil use into account; for measures in articles 31, 37-40 and 43-47 of Reg. 1698/2005, must not contain elements linked to fixed investment costs.

which are influenced by compliance with commitments of measures, whereas in the second case, instead of comparing two complete budgets, deriving the level of payment from the different profitability of member farms that have signed up for the measure and those that have not (counterfactual analysis).

Methodological guidelines for analysis - The method of analysis should be based on a comparison between a condition of not adopting the practices and commitments provided for in the measure and a condition (hypothetical or real) of signing up for the measure, in compliance with all commitments and constraints. The comparison allows us to highlight the resulting effect on income and costs, including, where appropriate, an evaluation of the transactional costs of the measure.

The different ways of calculating the subsidy are distinguished both by the availability of data and to the different ways the measure is implemented. In the case of measures whose commitments affect both costs and revenues from agriculture, we should proceed with an economic analysis of the counterfactual type by comparing the income (gross margin of production) of farms participating in the measure with those of farms that do not adhere to the measure. The difference between the gross margins of the two groups of farms is the level of comparison on which to evaluate the appropriateness of the measure.

1. The simplest counterfactual economic analysis can be based on microeconomic data drawn from official sources (FADN, or other sources of economic and structural agricultural data, such as direct surveys by regional and provincial administrations). The analysis provides a comparison of income levels calculated on groups of member farms which do and do not belong to the measure.

2. The comparison between the two groups of farms may be based on historical data if the measure was already implemented in earlier programming period with baselines and commitments substantially similar to those of the current period.

3. In the case of new measures, for which no historical data are available, the comparison should be based on a simulation of the most likely changes in costs and income resulting from the adoption of the commitments called for, beginning with data and information derived from available sources .

Terms of use - It's necessary to emphasize that the sources to be used, in accordance with Community law, must be reliable and verifiable, preferring, where possible, official statistical sources (ISTAT, FADN, EUROSTAT). The use of other sources is possible if the lack of official data is reported. Expert opinion or information provided by producer co-ops can be used (preferably in writing), if other sources are not available, but must in any event be properly documented.

Conditions for use of FADN, as well as those from other sources, are generally those that govern any technical-scientific investigation. Therefore no source of data is better than another in terms of quality: it must be identified and evaluated in relation to the targets of the survey and the availability of information.

In regard to the use of technical and economic FADN data for the economic justification of subsidies for rural development, it should be noted that the FADN, as would happen in the case of other databases that include information on historical earnings and economic characteristics of farms, could be inadequate in the following situations:

- Where the measures of the new planning period are substantially different from previous programming and it is therefore not possible to use economic data of farms (members/non members of the measures) related to the period before;
- when one of two samples (member/non-members) is not large enough;
- for measures relating to production (crops or livestock) that are not sufficiently investigated within the FADN (e.g., forestry measures, or in some cases landscape measures).

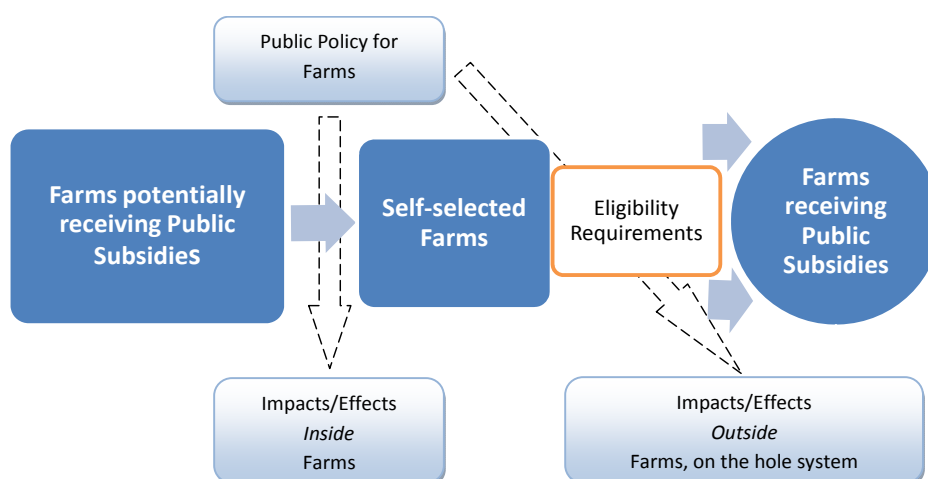
The statistical representativeness of the FADN is ensured only at regional level by FT and by ESU. So most likely the selection of samples and sub-samples aimed at analyzing the fairness of subsidies is unable to provide sufficient sample size for statistical representativeness. However, as the FADN is the only available source of economic data for farms, its use is appropriate and necessary, although the number of sub-samples should be evaluated in order to ensure sufficient consistency of the data used.

5 The FADN for counterfactual analysis

The evaluation of the success of a policy of aid to farms is the focus of this chapter. The main purpose is to highlight the potential of the FADN database to develop an analysis of effects or counterfactual analysis.

The logic of public intervention in this case is essentially based on the concept of compensating for a particular disadvantage for farms that are not in a position to realize development projects (investment, quality, innovation), but which would have the capacity to achieve them, generating a positive impact not only for the farm itself, but also for the economy as a whole (Sisti, 2007). The farms receiving public subsidies (Figure 5.1) are the result of a two steps selection process: the first is a process of self-selection (in which farms that apply for aid have a certain ability to carry out projects), while the second comes from merit, from meeting the eligibility requirements established by the public administration.

Figure 5.1: The Logic of Public Policy when farms are involved



Source: INEA

Without going into detail of specific measures or actions, it is nevertheless important to clearly define 'the evaluation branch' of a given policy, since the evaluation itself depends on it. In particular, it is necessary to identify the evaluation question (effects on farm performance – increases in turnover, employees ..; effects on increasing the quality of production; effects on the competitive ability to remain on the market ...). Once the sphere has been identified, more specific analysis can proceed, using comparisons to understand and measure the value of a specified success/failure. In these cases, reference is made, for example, to changes observed in beneficiaries compared to non-beneficiaries of a policy (for comparison/benchmark) using different

tools and approaches both quantitative and qualitative, such as indicators to be monitored over time or using data from direct surveys. Only when the concept of causality is introduced (causal nexus) between hypothesis and theory, between intervention and change in specific farm performance, we come to the problem of estimating impact, or to the concept of counterfactual analysis.

The approach of the so-called counterfactual paradigm is based on the *effect of an intervention* as "the difference between what we observe after the intervention was implemented and what we observed during the same period and for the same subjects, in the absence of intervention "(Martini, 2006). According to this reasoning, the effect of a policy is the result of the difference between an observable value (what we observe after the intervention) and a value that is not (what we would have observed in the absence of intervention).

Establishing the causal link, identifying the net contribution of a particular measure, is precisely the cognitive goal of the counterfactual approach. However, it is clear that there are at least two types of problems: the first involves the changes recorded over time and the difficulty in isolating the components due to intervention policy from other independent exogenous variables. The second is the definition of counterfactual, or the inability to observe and, therefore, to measure an effect on subjects which cannot be both beneficiaries and non-beneficiaries of a policy (the problem of non-observability of the counterfactual was already explained by Holland (1986) in the late eighties). There are many arguments on this point and, while referring to the specialized literature for further investigation of the case, here we wish to highlight at least the following reasoning: the fact that it is not possible to observe a direct effect does not imply it can not be estimated by constructing the "missing" counterfactual element, replacing it with a plausible, reasonable substitute, and that it is possible, therefore, to propose an evaluation between an actually observed situation and an appropriately estimated one.

This is the so-called experimental method, based on the construction of a control group or experimental group, consisting of subjects as similar as possible to the beneficiaries of a particular intervention, and through which the differences between the groups can be evaluated. The debate on experimental and non-experimental methods is still open; supporters of both methods feed schools of thought geared to the American experience in the first case, and European in the second. Of course, it is possible to argue the advantages of both methods, as well as recognize their limitations, but in this context, we simply highlight the fact that the counterfactual approach can use both methods and that, in any case, it is one of the possible ways to provide an answer to a specific area of interest: measuring effects by surveying causal implications.

5.1 Evaluating the impact of farm policies

As far as the RDPs are concerned, it is worth noting that public intervention is designed in order to favour a specific area or particular subjects there involved, which are not identified using a process of random assignment, but taking into account some criteria that tend to favour marginal areas or units that need support for development (demographic, economic, market, quality). The main problem arising in this kind of process is linked to the fact that it is difficult to distinguish objectively the changes brought about by the programme, which take place in the time called for in programming, and those attributable to other exogenous factors, that is, unrelated trends.

The evaluation of local policies is a topic that for some years now has affected the public administration. In terms of *ex-post* evaluation, however, the references are rather rare. What makes evaluation more difficult is, on the one hand, the long time it takes to implement policies, and on the other the difficulties involved in evaluating effects and their significance in terms of progress and development (Arzeni et al., 2003). As the evaluation of impact is designed to measure effectiveness and efficiency, that is, to provide useful information to understand how government intervention has contributed to positive change in a given situation, it becomes crucial to produce an estimate of the value that would have been obtained in the absence of intervention. The literature on these issues, as mentioned previously, is well-established, whereas the number of applications is quite limited since they often refer to monitoring systems (comparison between results achieved and expected results) rather than systems based on applied statistical methods. The purpose of this paper is therefore to highlight the importance of an empirical analysis of this kind.

The main strategies that can be adopted to measure the impact of policies are the *one group design* and the *comparison group design*. The first method compares only those farms that receive subsidies (before and after), while the second studies the differences between the group of farms that benefit from the measure and those that remain excluded. Both approaches generate bias in the estimates of impact, yet it is possible to adopt some methods which limit their range. The decision to use either approach depends on the evaluation of different types of intervention, on the territorial characteristics affected by the intervention, and on the quality and nature of the data available: therefore, no method is better than another (Cisilino, 2010).

The first question that emerges in making an impact analysis, in general, is the evaluation of the changes that affect a given variable (or outcome variable) (such as varying level of income, investment, employment,...). The second is to evaluate how these changes are due to the programme, rather than to events caused by economic factors (Rettore et al., 2002). These difficulties stem from the fact that local governments agree to encourage specific holdings which normally have some kind of disadvantage (specific areas classified as less-favoured areas, specific categories that need more incentives and so on).

The main statistical methods used for impact analysis

Shift-share analysis is one of the most widely used analytical techniques in one group design. It is used to limit the bias due to omitted variables (Bondonio, 2000). The methodology is based on the breakdown of variance components recorded pre- and post- intervention. The different components express the programme's effects and those due to other exogenous factors such as economic trends. In addition to the values for the variable in question monitored over time (before and after) it is therefore necessary to get data on economic trends in order to identify the values of that component. The measure of how support received by farms through the RDP has helped, for example, to raise potential level of income would be isolated and distinct from effects of positive economic trends that may have affected the entire regional agricultural sector. The data processing of this common component passes through the identification of an overall growth rate to be referred to the region as a whole and looking at values assumed by the output variable pre- and post- intervention. For further information please refer to the literature (Dowall 1996, Rubin and Wilder 1989, Dawson et al 1982).

The difference in difference method is used in comparison group design, uses panel data and is designed to limit bias due to selection (Bondonio, 2000). Here again, two groups are identified: one which receives a subsidy and one which doesn't (control group). The two groups are observed over time, beginning with a year zero, before the programme is implemented, when none of the monitored holdings have received any benefits. This makes it possible to limit the differences between holdings (beneficiaries and control group) and to limit bias. For more information, see the literature (Papke 1994, Moffit 1991).

Also as part of *comparison group design*, another technique that allows control of the *selection bias* is the so-called selection process modelling approach. It is essentially based on a probit-type model $P(D_{i=1}) = \Phi(X_i\gamma)$, where X_i is a matrix that incorporates the time-invariant characteristics of the unit being monitored before the intervention. The application of the probit model can help determine the most significant variables that characterize the inclusion or exclusion of the programme's interventions. This methodology also develops a regression model that includes probabilities of inclusion estimated by the probit model. For further information refer to the literature (Heckman and Hotz 1989, Ashenfelter and Card 1985 and others).

A third application to *comparison group design* is an approach used in the international literature (Barnow 1987, Rosembaum and Rubin 1984 and others), called *statistical matching*, which estimates the impact of the programme by selecting, for each unit i -th affected by incentives, a corresponding unit i^* -th among those excluded from the program. In this case, the problem of *selection bias* is addressed by constructing a control group as similar as possible to the group of beneficiary units and of the same size. Of course, the method is more effective the larger the non-beneficiary group is than the other. In this case, in fact, the choice of more similar units would be

larger and therefore more accurate. Again, the starting point is the implementation of a Probit model that makes it possible to define the so-called *propensity score* (Rosembaum and Rubin, 1984) as a basis to discriminate units excluded from the programme. Units with scores most similar to those affected by the programme are included. Variations on this method introduce constraints, for example territorial or size-related.

In conclusion, to make an estimate of impact, the construction phase of the comparison group is particularly important. For this purpose, you can use two large families of methodological tools: parametric models (regression) and nonparametric estimators (combination methods). In both cases it is necessary to take into account the following elements:

- It is important to build a comparison group in an appropriate way; subjects not exposed (non-beneficiaries) to funding should have characteristics as similar as possible to those exposed (beneficiaries). In other words, the groups included in the analysis should be comparable (statistical matching). Otherwise, the estimator obtained is defined as fragile.

- It is important to consider the variability of impact among the beneficiaries: the estimate of average impact may not be sufficient to provide an overview of the situation. It may be necessary to observe not only the average of the results but also the variance. Only where it is possible to ascertain that the variability of impact between subjects is negligible then we can consider the average impact on beneficiaries as a measure of overall average impact.

- If we consider a threshold value as a discriminating factor in making the list of recipients, we can restrict the analysis to those subjects distributed around that value, and make an estimate of the average impact only on those subjects. Again, however, selection of subjects is essential and the variable must be univocal and unique (which may cause selection bias), according to which beneficiaries and non-beneficiaries are identified (particular case, borderline case).

5.2 The FADN satellite system

To evaluate the impact yielded by public measures on farms, it would be preferable to have observations, if possible, repeated over time and related to those regularly included in the FADN database (constant sample). It is certainly preferable to use the FADN database whenever a description is to be made of the structural and economic context, since it is a "weighted" sample of farms and therefore properly representative of the universe of Italian farms larger than the 4 ESU.

However, when estimating the effects of agricultural policies and rural

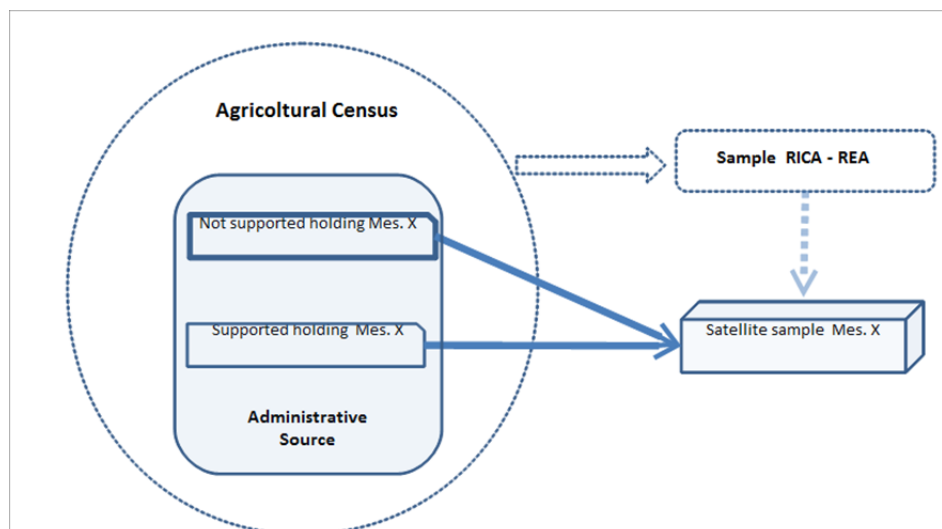
development, it is evident that the target of evaluation is, first, the recipients of public funds. Therefore, the universe of reference to draw from in order to measure the impact of support to agriculture and, more generally, to the rural community are, in fact, beneficiaries of policies that appear on administrative lists drawn up by AGEA and regional paying agencies, the Managing Authorities of RDPs and ROPs.

Precisely for this reason, since mid-2000 INEA has developed a proposal for a project to consider use of the FADN database to estimate the impact of food policies and rural development measures received by agricultural holdings, based on a "satellite" sample, meaning a system consisting of multiple linked samples.

The methodological assumptions of this solution lie in the fact that certain procedures - suggested by the guidelines set by the European Commission and commonly used in evaluation techniques - are often comparative: they consist in relating, for each indicator, a situation measured on a number of subjects involved in an individual measure (beneficiary farmers) with the situation without the measure (counterfactual situation). The latter is in turn obtainable by means of appropriate techniques based on the use of representative samples of subjects from farms belonging to the same universe of reference.

The hypothesis developed by INEA is based on the relatively large FADN regional sample, which is used as a benchmark for others. It is the regional sample of reference (with the exception of small farms, considering only farms of more than 4 EDU) which, since 2003, has been statistically representative. According to the satellite design, other smaller samples (satellite-samples) revolve around the regional sample. Each satellite-sample, in fact, refers to the group of regional farms that benefit from special agricultural policy measures, or rather, have signed up for a particular measure activated through the RPD/ROP (Figure 5.2). The connection among samples is ensured by a set of common information surveyed at the farm level.

Figure 5.2 - Representation of the INEA satellite design



Source: INEA, 2001, revised

Therefore, satellite-samples represent beneficiary holdings of a given measure of agricultural policy and rural development, as they are selected from the analogous regional collective (administrative records). These holdings yield useful information for evaluation, consistent with those available on holdings in the basic sample. This ensures the ability to compare with both the total FADN sample, and with that part of the same sample made up of similar subjects, but which do not receive aid.

In addition to measures 121, 112 and 211, other elements could be investigated using the FADN, regarding: some specific aspects relevant to farms that receive subsidies associated with agri-environmental measure 214 and some aspects of the farms that offer non-agricultural diversification activities (agritourism), measure 311.

The main aim, therefore, for which provision was made for the collection of such satellite- samples (identified by a specific code in the data base for evaluation) is precisely to contribute to the fulfilment of the requirements related to programming, monitoring and evaluation of the RDP.

It is noted, finally, that the identification of appropriate satellite-samples may produce a double benefit: to develop spatial analysis on one hand, and dynamic analysis on the other. These aim to describe the changes in the phenomena under observation. To do this, we can proceed as described above, observing a sample of farms over time and monitoring any changes, or giving evidence of the structural and economic situation of the holding in the absence of intervention, then repeating the analysis at a distance of enough time for the effect of the investment to arise.

Which regions use satellite sample/best practice

To meet the requirements for programming, monitoring and evaluating measures of agriculture and rural development, several Italian Managing Authorities of the programmes financed by the EU proceeded, during the period 2000-2006, with the implementation of the so-called satellite-sample surveys. The satellite-sample is selected from farms that have acceded to specific rural development measures, and the gathering of information is done using FADN-INEA methodology, uniformly with FADN surveys, to make the collected data comparable. Under agreements signed with regional governments that manage RDPs, aimed at collecting satellite-samples, INEA presents the results of the survey in the form of elementary farm data and statistical tables accompanied by a brief comment. This will also include access to the FADN data warehouse which contains the database for evaluation, presented in the form of standard processing.

Below is a table listing the essential information concerning the experiences conducted in Italy processing with regard to satellite-sample surveys.

Diagram 5.1 - Use of satellite samples in the Italian Regions

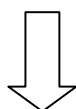
Region	Observation period	Av. number of farms surveyed in a year	Surveyed aspects
Valle d'Aosta	1987 – 2008	200	<ul style="list-style-type: none"> • production categories • less favoured areas • diversification
Piedmont	2003 - 2009	450	<ul style="list-style-type: none"> • modernization • setting up of young farmers • diversification
Lombardy	2007-2009	200	<ul style="list-style-type: none"> • modernization • setting up of young farmers • less favoured areas • agri-environmental measures
Friuli VG	2004-2005	160	<ul style="list-style-type: none"> • modernization • setting up of young farmers • less favoured areas • agri-environmental measures
Toscana	1994-2009	200	<ul style="list-style-type: none"> • production costs
Lazio	2004	250	<ul style="list-style-type: none"> • modernization • setting up of young farmers
Abruzzo	2005-2009	200	<ul style="list-style-type: none"> • modernization • diversification • less favoured areas
Basilicata	2010-2012	450	<ul style="list-style-type: none"> • modernization • setting up of young farmers • less favoured areas • agri-environmental measures

Source: INEA

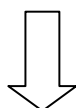
5.3 The general criteria to build a satellite-sample

Faced with the need (or willingness) to employ a counterfactual analysis based on FADN data, it is useful to organize the process by following three main phases:

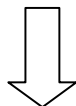
Universe of reference: the list of farms benefiting from the measures of the programme (provided for each measure and the object of interest) - derived from the monitoring database of the Regions



Identification of the **FADN sub-sample** consisting of farms benefiting from measures: probably the number of farms is insufficient (too low) or inadequate to perform in-depth analysis



Integration of the FADN sub-sample: building a **satellite-sample** (for each measure under consideration) consisting of units belonging to the regional list of beneficiary farms



Applying the FADN **survey** using INEA methodology to farms in the satellite-sample. This makes it possible to compare with both the total FADN sample, and with that part of the same group of similar subjects, but that do not receive subsidies

The crucial point is the integration of the sub-sample of FADN beneficiary farms with beneficiary farms included in the administrative records.

The criteria for the identification/selection of the farms awarded funding by the Managing Authority vary according to measure. Diagram 5.2 summarizes a possible path of analysis, as an example. In this case, the criteria used for the analysis of the measures 121 and 112 are substantially the same and are closely related to the FADN. They are not, therefore, considered criteria of eligibility because they vary from region to region, as well from measure to measure. The identification of similar farms can be obtained using the approach of so-called *statistical matching*. Stratification should be based on structural variables, or independent variables that therefore do not involve elements linked to the performance of the farm in economic terms (income, revenue, costs). The latter, in fact, are the object of analysis itself, and it is on those variables that some thoughts and evaluations can be produced in order to identify differences in the behaviour of farms and to establish any correlations or connections with the effects of the measure/programme.

Steps:

- Analysing the distribution of farms on the regional list of beneficiaries, taking into account the established criteria;
- Analysing the distribution of FADN beneficiary farms, taking into account the established criteria;
- Fixing the satellite-sample's number of farms, taking into account the analysis requirements.
- Building the satellite-sample by selecting farms from the list of beneficiaries included in the administrative records, in accordance with the proportionality method (this is the simplest criterion, but other methods could be adopted).

Diagram 5.2 – Example: Stratification in the case of farms subsidised by measure 121 and measure 112

Analysis of the type of investment Analysis of new settlement/takeover		
Criteria	FADN Variables	FADN stratification indicators
Similar natural and environmental conditions	Land productivity, altitude (lowland, hills, mountains), altimetry, less-favoured areas, other geographical categories	
Similar economic size	ESU (based on 7 categories)	
Same farm type (category of activity)	FT (from FT pole based on 8 categories to specific FT based on 67 categories)	cell FT/ESU/Province (or other breakdown)
Same location	province, municipality, other geographical breakdown (rural area, based on environmental impact...)	
Same production factor envelope (land and labour – considering homogeneous size classification)	UAA, UAB, TWU, FWU, machinery, land capital	UAA/SAT, ULF/TWU, machine potential/land capital

Source: INEA

In summary, it is necessary to consider groups of farms that are as similar as possible, or that are highly comparable: the averages of key variables are similar, the structural envelope is similar, the environmental and natural conditions are similar. The identification of similarity can be made with some options, such as, for example, a weighted ranking system (highest score – most similar farm) or by using the so-called system of minimum criterion of similarity: it is built on a range determining the level of similarity (if the farm falls outside the range it is not selected);

Once the terms for identifying the comparison groups¹⁰ have been defined, we can proceed with the analysis.

Please find below an example aimed to give evidence of the importance of the source chosen for the analysis, as well as the reliability of the information and how difficult it is to attribute cause and effect of a particular subsidy on beneficiaries.

Example: monitoring and evaluation of farms benefiting from a certain measure, which remain on the market

A hypothetical analysis would use the following actions:

- check the survival rate compared to corresponding non-beneficiaries (by economic activity, size, location). Usable sources include the list of active farms of the

¹⁰ Comparability: recall that FADN farms have less than 4 ESU, whereas farms on the list of beneficiaries are not restricted by size.

Chamber of Commerce;

- verify the significance of the results (if the observed differences are not statistically significant it can be held that farms that enjoy the benefits of the programme are better than the others).

This type of analysis could be useful but not sufficient to provide a conclusive argument for a priori assumptions made. An analytical process of this kind, in fact, shows some weaknesses (to report), in particular, the following points:

- Definition of control group;*
- Technical inefficiency and allocation inefficiency;*
- Evaluation of differences*

As far as the first point is concerned, it is noted that the control group, which consists of non-beneficiary farms, could have been defined in an inappropriate way, even while respecting some criteria of similarity such as economic activity, size and location. Those elements, in fact, may be insufficient to achieve a good level of correspondence of the groups. In order to integrate the elements of homogeneity and spatial characteristics of the farm, some other information might be involved deriving from the selection criteria adopted by the regional Managing Authority. Furthermore, it would be desirable to have access to the list of farms not eligible for funding.

As for inefficiency, it is noted that it could be technical inefficiency, caused largely by errors in the selection of farms eligible to benefit, or as allocation inefficiency, potentially induced by incentive scheme itself. The problem is the difficulty encountered in distinguishing the nature of inefficiency: the former because it should involve the evaluation of the admission of beneficiaries, in the second case because support policies generally are not based on random criteria, but are established by public decision-makers (see section 5.1).

Finally, assuming to proceed with the comparison, attention is drawn to the fact that statistically weak bases at the start lead to fragile results: In this example, the lack of information is due not so much to the incompleteness of the source, but rather to lag time that occurs in updating of data (the archives of the Chamber of Commerce for activities/cessation of farms tend to be updated slowly).

In conclusion, the evaluation of the survival rate of beneficiary farms, and control over the significance of the results of the example referred to therein, may have a certain amount of bias due to poor accuracy in defining the comparison group and the source selected to carry out the analysis.

6 Concluding remarks

In this brief review on the use of the FADN database for evaluation, some possible uses of this statistical source have been presented, highlighting the main difficulties that may be encountered. Some general points are given in conclusion.

In considering the FADN as a source of secondary data for evaluation analysis, it is necessary to pay particular attention to the following:

- The representativeness of the results generated by processing FADN data is ensured at the regional level: at lower territorial levels, caution is required.
- The rotation of the sample: it provides a variable that can affect the continuity of observations (sample basis).
- The periodic review of information content should be monitored to maintain and provide updated information.
- Satellite-sample: for the evaluation of rural development programmes this could facilitate potential counterfactual analysis.

In the description of the context (ex-ante, AER Annual reports, mid-term evaluation, Ex-post) the use of FADN information therefore requires some attention/caution, both for the setup steps of the analysis and in the interpretation of information. In light of the goal, it therefore becomes necessary to make an in-depth study of the results obtained. The processing of FADN data is indeed a sensitive issue and only a deep knowledge of the source can provide a good degree of reliability.

As to the possibilities offered by FADN in the process of diagnosing needs, namely context analysis and quantification of baseline indicators, the development of the database allowed us to significantly increase and improve the use of Network for such activities. In particular, the FADN, alongside other sources such as ISTAT, ISMEA or individual regional systems of observation, is an important tool for the description of the various productive sectors and farm performance, in greater detail. Of particular interest is the opportunity to use the information to perform simulations, to describe changes in the implementation of measure policies. In fact, recall that the FADN is the only available source of economic information, both in terms of production and income and costs. However, the above-mentioned critical issues remain open, as well as the resulting cautions regarding the representativeness of the results.

When using the FADN to quantify specific batteries of indicators, with value for monitoring or analysis results, the same criticism must be taken into account. In fact, taking the example of the specific indicator of the result for the increase of value added on beneficiary farms, in several cases the Commission identified the FADN as a possible source of data to be used as an alternative to direct survey of all measure beneficiaries. This possibility, of course, offers significant advantages for the Managing Authority,

especially in terms of cost and quality of information. However, the problem of representativeness of the sample is even more evident, when only the treated groups are selected; just as there is a temporal difficulty with the FADN survey. In fact, the information is not always available when it is required for evaluation and monitoring. Another aspect to note is that the FADN, by its nature, can provide information about the agricultural sector, whereas, at present, it cannot explore forestry and processing.

In regard to the use of technical and economic FADN data for the economic justification of subsidies for rural development, it should be noted that the FADN may be inappropriate for measures relating to production (crops or livestock) which are not sufficiently surveyed (examples: forestry measures, or, in some cases, landscape measures). Similar limitations may be a low number of available observations (beneficiaries and/or non-beneficiaries), and, of course, those regarding measures of the new programming period which are substantially different from those planned in the previous one (2000-2006). It is important to consider that the statistical representativeness of FADN is ensured only at the regional level by FT and by ESU. So, most likely, the selection of samples and sub-samples to be used in analyzing the suitability of subsidies will not be able to provide sufficiently large sample size to make them statistically representative.

The impact evaluation of a programme also involves the measurement of the impact of individual measures. Among the major implications to be taken into account in this process is the difficulty of discriminating changes produced by a particular intervention with regard to changes due to exogenous factors (problem of self-selection). The strategy to estimate impact is to analyse the phenomenon under observation and to determine the relationship between phenomenon and intervention: isolating the components to identify which factors influence the change (*selection bias*). The main elements to consider in dealing with such a route are: the importance of the data (availability of information and its appropriateness to the objective), the need to build comparison groups in an appropriate way (comparable subjects), and, finally, the evaluation of the consistency of impact (average impact is rarely sufficient, it is necessary to consider the variability of the impact itself, so as not to report results in sub-populations rather than the entire group concerned).

In general, for the validity of the results to be obtained for evaluation purposes, it seems essential to maintain a vision of awareness: in fact, as accurate as stages of the construction of an analytical process of this type may be, it is not possible to produce a valid result in absolute terms. Although the maximum effort is produced in order to proceed with the utmost attention to both analysis of the phenomenon and available data, as well as to draw a sturdy comparison design between beneficiaries and non-beneficiaries, there is always a degree of uncertainty, such that, finally, it is not possible to determine whether a development policy has an impact, nor to measure its extent with certainty. Another procedure, another statistical methodology, could lead to different results. Thus, it is wise to place ultimate significance upon the word *estimate*. Therefore impact estimation would be the possible result.

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