



Enhancing the Italian FADN for sustainability assessment: the state of art and perspectives

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Abstract

Farm Accountancy Data Network (FADN) is one of the most important microeconomic surveys in Europe. It collects information suitable for use in performing structural and socio-economic analysis of the agricultural sector in all the Member States. Contents and purposes have evolved over the time depending on the informative needs of the EU Commission and CAP's priorities. As a part of the Green Deal, CAP is expected to contribute to the environment, climate change and biodiversity objectives beyond 2020. In this new framework, one initiative launched inside the Farm to Fork Strategy has been the change of name from FADN to Farm Sustainability Data Network (FSDN) including variables related to the environmental and social aspects of farming. Like in other EU countries, the information collected by the Italian FADN exceeds that required by the EU regulations, allowing to some extent consideration of special characteristics of national agriculture. However, further variables could be added or changed, gathering them directly from the farmer, by including the existing database or through targeted questionnaires on FADN sub-samples. The new survey will maintain and improve the current role of FADN, reinforcing the analytical and political relevance of the network by adding further dimensions of sustainability. The discussion is on-going at EU and National level and this paper is a contribution to this debate. It gives a

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description of the environmental and social data gathered by the Italian FADN together with a consideration regarding about the opportunity and the possibility to enhance the system in view of the future period under evaluation. The switch to FSDN will require an effort from the Member States in terms of IT infrastructure, economic resources, new ways of collecting data and staff involved in data collection and the verification process.

Introduction

The Farm Accountancy Data Network (FADN) is one of the most important microeconomic accounting surveys collecting information suitable to be used to perform structural and socio-economic analysis of the agricultural holdings. It is a yearly survey carried out in all the Member States since 1965 and according to the same bookkeeping principles that make possible comparisons among different regions or countries. The FADN Farm Return collects more than 1,000 variables (Council Regulation EC 1217/2009).

When Common Agricultural Policy (CAP) was established, policies focused mainly on the optimum utilizations of the production factors. The primary aim of the network was to gather accountancy data for the determination of farm incomes and the assessment of CAP's impact on farm profitability. However, since 1980s, CAP measures have increasingly supported production methods oriented to the environmental protection and countryside maintaining; in 1992 the Council Regulation 2078/92 introduced schemes and methods compatible with the environment and further support was provided by Agenda 2000 programme which extend the adoption of agri-environmental measures under the Rural Development Regulation 1257/1999. In the last 20–25 years, agricultural policies have changed again, to meet new societal needs and priorities. CAP reform 2014-2020 has addressed commitments to economic, social, and environmental sustainability with the Rural Development Policy (RDP) oriented to improve competitiveness on agriculture, sustainable management of natural resources, climate change mitigation, balanced development among territories. As a part of the European Green Deal, CAP is expected to contribute to these objectives even beyond 2020.

New policy priorities lead to new data needs. According to the future strategy for agricultural statistics, there are three dimensions to cover: (i) economic dimension of agriculture regarding the production, market, and income of farmers; (ii) environmental dimension deriving by the sector's role as a user of natural resources and provider of environmental services; (iii) social dimension concerning living conditions, quality of life of farmers

and rural households (European Commission, 2015). Although FADN is not officially a European statistic, is very close to the European Agricultural Statistics System (EASS) and is considered one of the most important sources of data for the analysis of agricultural policies. Even if not designed to satisfy environmental and social informative needs, characteristics as the annual data collection, the breakdown at farm level, the time-series, make FADN one potential tool for the assessment of farm-level sustainability (Kelly *et al.*, 2018). Among the more than 50 datasets included in the EASS, IACS (Integrated Administration and Control System) database managing CAP payment to the farmers and LPIS (Land Parcel Identification System) have the same detail level and frequency as FADN. But while IACS and LPIS offer little potential in terms of measuring farm-level sustainability because of the lack of social and environmental data, FADN is a more promising source for measuring sustainability.

Topics like environment, animal welfare, innovation, social aspects are limitedly covered by FADN. To fill this gap, a debate around the opportunity to improve the current scheme of the survey is being developed around the scientific communities, the DG Agri services and the stakeholders involved in the network. Projects like FLINT (Farm Level Indicators for New Topics in policy evaluation) have demonstrated how policy evaluation could be improved with a better and more complete data, covering new policy topics and multiple aspects of sustainability. This is the background against which the initiative to convert FADN in a Farm Sustainability Data Network (FSDN) has been launched inside the Farm to Fork Strategy with the aim to expand the scope of the current network, in line with the objectives of CAP and the Green Deal.

After the launch of the initiative¹, targeted consultations have been planned in May 2021 while a workshop is organized for June 2021. The adoption of the basic act proposal is scheduled for the second quarter 2022. At National level, the opportunity to modify the current set of information is currently under discussion in a working group, established inside the Policy and Bioeconomic Unit of the Council for Agricultural Research and Economics (CREA-PB). Italian FADN collects more information than those required by the EU regulation. Adding further environmental and social variables will permit to enhance the whole system and supply crucial information for the future evaluation analysis. The paper resumes the most important concerns of this debate, describing the key elements of a more sustainable Italian FADN system and how it will be possible to improve the survey including all the dimensions of sustainability. New information could be gathered adding the

1. <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12951-Conversion-to-a-Farm-Sustainability-Data-Network-FSDN->.

new variables in the current system's architecture while, in case of detailed or specific investigations, additional modules can be designed for sub-samples or for satellite samples. The paper is structured in a first paragraph that gives a background of the debate and how it has evolved in the European context. A short literature review regarding the use of FADN for environmental and social sustainability assessment is the focus of the second paragraph. The analysis of the Italian FADN is done in the third paragraph: normally used for the evaluation of farm costs, revenues and incomes, the survey is also a source of data of other kind of information regarding the sustainability of farm activities. These data, not collected in the EU FADN, are a strength of the national FADN but, nevertheless, there is room for improvement. Finally, the conclusions.

1. Background

One of the higher informative demands to FADN system in these last years is consequent to the new definition of the Common Agricultural Policy (CAP) that, according to the legislator, is going to be more coherent with the environmental legislation, more oriented to the knowledge, innovation, digitalization and more addressed to the achievement of the results. CAP is a part of the European Green Deal (Com (2019) 640 final 11/12/2019), the future European policies strategy which aims are, among others, the improvement of the food system (from the farm to the final consumer) and its connection with health and environment. These contribution are resumed in a recent document (Staff Working Document (2020) 93 fin) highlighting the role played by farmers, foresters, agri-food business and rural communities in (i) building a sustainable food system through the Farm to Fork strategy (Com (2020) 381 final 20/05/2020); (ii) protecting and enhancing the variety of plants and animals in the rural ecosystem as required by the new biodiversity strategy (Com (2020) 380 final 20/05/2020); (iii) contributing to the climate action of the Green Deal to achieve the goal of net-zero emissions in the EU by 2050; (iv) supporting the updated forestry strategy announced in 2021; (v) contributing to a zero-pollution action plan to be set out in 2021 by safeguarding natural resources such as water air and soil.

To be aligned with the Green Deal, the new CAP has included several measures: the eco-schemes, the strengthening of cross-compliance and several actions having as main aim the environment protection, the climate change mitigation, the improvement of agricultural statistics. More specifically, Member States are required to guarantee a better data quality, a set of indicators immediately updated for all the monitoring and evaluation activities, an increasing attention to the development of common

and integrated approach in the collection and sharing of data. One of the instruments proposed by the Commission to reply to these requirements is the initiative to convert the Farm Accountancy Data Network (FADN) in Farm Sustainability Data Network (FSDN), according to a scheme more oriented to investigate the three dimensions of sustainability, beyond the economic one. This means a new approach to the survey, an integration of new variables, an estimation of new indicators more suitable to be used to measure the new phenomenon of the CAP. At EU level, the concept of sustainable development is becoming increasingly important and a key element of all the political strategies, including the agricultural ones. The EC has included three priorities in its Europe 2020 strategy and one of them is “Sustainable growth: promoting a more resource efficient, greener and more competitive economy” and also recognizes that agriculture delivers “multiple economic, social, environmental and territorial benefits”.

The importance to have more complete and better data to improve policy evaluation has been explained and demonstrated in the FLINT (Farm Level Indicators for New Topics) project. Countries that have already gathered some of the sustainability data for a longer time in their National FADN seem to be able to perform better evaluation analysis of sustainability. In compliance with this evidence and with the new policy framework, the transformation process of FADN in FSDN has been launched at EU level: the number of new variables and the methods to collect the supplementary information are currently under discussion among the stakeholders involved in the survey.

Regarding the evaluation of rural development policies, an interesting workshop focused on data management for the assessment of RDP effects has been organized by the European Evaluation Helpdesk for Rural Development (EEHRD) (European Commission, 2020). The workshop (that took place online on 13-14 May 2020) offered insight into the use of existing data sources, the limitations and challenges encountered, and the solutions applied for better identification and use of data for evaluation purposes. The workshop culminated in several key lessons for the assessment of social, economic, and environmental effects and in a recommendation regarding the need for harmonization and integration of data sources. To perform the evaluation of socio-economic effects of the RD policies, the current lack of information could be covered using experimental approaches or additional surveys on the beneficiaries that can be combined with the existing datasets. This means that FADN could be integrated with supplementary surveys or with additional samples if necessary. The same could be said for the evaluation of environmental effects where further efforts must be done to integrate and harmonize the existing sources of information not always aligned in terms of contents, quality of data, coverage, definitions and frequency.

This last aspect has a paramount importance considering that the future challenge of the EU agricultural statistics will be a planification of the survey systems to connect and integrate the existing databases.

The first important workshop specifically devoted to discuss the opportunity to convert FADN in FSDN was organized 8-9 February 2021 with the aim (i) to collect information on existing sustainability variables at EU and national level; (ii) to share information on tools that could be used to collect farm level data; (iii) to share private and public practices on data use for advising farmers. This workshop has given the opportunity to define a roadmap describing the problem to be tackled and the objectives to be met, explaining why EU action is needed and outlining the policy options. In May 2021, a public consultation on this roadmap will be launched based on a target consultation questionnaire (topics on reinforcement and simplification of FADN): the target audience includes farmers, administrations, data collectors, advisors, researchers, evaluators, and policy makers. Feedback of the consultation and an exploration of possible concrete elements of FSDN will be discussed in a second workshop, planned for July 2021.

2. FADN for environmental and social sustainability assessment: a short literature review

FADN has been used as main source of information in several analysis performed at European, national, and regional level. Generally, FADN permits to evaluate and assess mainly the economic dimension of the sustainability while social and environmental aspects can be investigated only adding further variables to the FADN core. Several countries have already an extended data collection in their national FADN systems to cover sustainability issues (Vrolijk *et al.*, 2016).

For each farm in the sample, information is collected using a Farm Return, a questionnaire including around 1,000 variables according to the EU Regulation. Information is divided in categories: (i) physical and structural data; (ii) economic data; (iii) financial data. The Italian FADN includes more than 2,500 variables, exceeding the core EU FADN (Table 1) and showing a greater level of detail especially for the technical aspects of farm management. This wider informative background of the Italian FADN permits to perform several analyses which go beyond the only economic aspects.

Most environmental and social sustainability studies based on FADN have been made at territorial scale, developing analytical frameworks based on sets of indicators calculated for intra-region and national comparisons. A rich literature on sustainable indicators at farm level is described in Diazabakana

Table 1 - Quantitative assessment of informative contents in EU and IT FADN

| Categories | EU FADN | IT FADN |
|---|--------------------|--------------------|
| Accounting records (<i>divided into 80 transactions in IT FADN</i>) | <20 | 30 |
| Accounts managed directly by user | 0 | 80 |
| Types of machinery and equipment | 0 | 300 |
| Types of farm buildings | 0 | 70 |
| Types of soil (<i>physical characteristics and fertility</i>) | 0 | 20 |
| Arable and permanent crops (<i>6,800 cultivars in IT FADN</i>) | <100 | 380 |
| Animal species and categories | <30 | 100 |
| Types of crop products (<i>main and processed</i>) | <50 | 54 |
| Types of livestock products (<i>main and processed</i>) | <10 | 35 |
| Categories of technical inputs (<i>fertilizers, seeds, etc.</i>) | <25 | 110 |
| Subsidy types (EU, National, Regional) | <300 | 500 |
| Total Variables (approximatively) | 1,000 | >2,500 |

et al. (2014), classified according to their use (farm decision support, farm comparison, policy evaluation).

One of the first analysis has been performed by Andersen *et al.* (2007) around a set of farm management indicators based on the farming intensity in each European Member States. They considered bi-dimensional farming typology based on land use and intensity to evaluate the environmental performance of farms. Another contribution comes from Van Passel *et al.* (2007), who implemented an empirical model to measure farm sustainability using FADN dataset in a group of dairy farms in Flanders during the period 1995-2001. The sustainable efficiency is measured based on the “sustainable value added” already applied in other studies (Figge and Hahn, 2004). Boone and Dolman (2010) and Dillon (2010) give a measure of sustainability starting from FADN data for a Dutch fattening pig farm and in the Irish agriculture, respectively. Another interesting approach is presented by Reig-Martínez *et al.* (2011), which built up a composite indicator at farm level to assess social, economic, environmental issues, combining Data Envelopment Analysis and Multi-Criteria Decision-Making methods. Composite indicators to evaluate the sustainability of farms have been proposed also by Gómez-Limón and Sanchez-Fernandez (2010). Zahm *et al.* (2008) and Cadilhon *et al.* (2006) describe the extension and adaptation of the sustainability indicators in the IDEA (Indicateurs de Durabilité des Exploitations Agricoles)

method (41 related to economic, environmental, and social aspects) to assess the sustainability of the main French types of farming. The set of indicators of IDEA were combined with information from the French FADN and Agricultural Census to develop the IDERICA method. The analysis highlighted the difficulty to calculate many of the original IDEA indicators and that the problems in the assessment of the social sustainability. The same difficulty is highlighted in the work of Sulewski and Kłoczko-Gajewska (2018) focused on a procedure for the estimation of the farm sustainability index integrating accountancy data with direct interviews with the farmers to cover the lack of social data in FADN. The need to enhance the social information in FADN emerges in Dabkiene (2016) that presents a sustainable use of FADN to cover the Sustainability Assessment in Food and Agricultural Systems (SAFA) subthemes. The analysis reveals a medium coverage of the SAFA environmental subthemes and a low coverage of social ones.

The need for monitoring and assessing sustainability at farm level led to the development of a common methodology for assessing the environmental impact of European Agri-Environment Schemes (AES). The Agri-Environmental Footprint index aggregates the measurement of agri-environmental indicators at farm level and has been used in combination with the UK FADN (Westbury *et al.*, 2011) to derive indicators of environmental performance in different farming systems and regions and to derive quantities of fertilisers used on farms by the total expenditure on fertilisers.

Several studies have been performed also in Italy. Trisorio (2004) assesses the sustainable development of the Italian agriculture suggesting a set of agri-environmental indicators and considering all the dimension of sustainability. Bodini *et al.* (2012) and Longhitano *et al.* (2013), evaluate the sustainability at farm level through the calculation of a composite index using as much as possible FADN database as main source of information and calculating the Sustainable Farm Index (SuFI) realised as an aggregation of data coming from a set of environmental, economic, and social indicators, ranking the farms to evaluate their potential role in the context of green-growth strategies.

As already mentioned, social sustainability based on FADN data is less frequently analysed because of the few specific variables collected inside the network that made possible only a synthetic assessment of this dimension of sustainability. An analysis in all the FADN European regions has been developed in Janiak *et al.* (2018) applying the Sustainable Value method to the 2004-2015 FADN database and using as input indicators the unpaid labour input, the paid labour input, the wages paid. Tantari *et al.* (2017) performed an analysis on off-farm incomes starting to the additional information collected in the Italian FADN regarding the farm's family in term of components, farm employment and off-farm incomes. For each family member, the income class, the income typology, and the economic

sector of employment is identified. The aim of the analysis was the estimation of the total familiar income, as sum of farm and off-farm income and it has stressed the importance of the second category in the assessment of the farm income situation.

3. Strengthening the use of Italian FADN for the assessment of environmental and social sustainability at farm level

The Italian FADN is a sample survey that collects information over more than 11,000 agricultural holdings representing the different type of farming and economic dimension classes of the whole territory. The sample represents 95% of the Utilized Agricultural Area, 97% of the Standard Production, 92% of the Work Units and 91% of the Livestock Units. The first scope of the Italian FADN is the satisfaction of EU informative needs: data are transmitted to the European Commission mainly for the evaluation of the CAP measures and impacts. At National level, the FADN dataset has multiple uses: agricultural policy analysis, evaluation of the RD measures, the payment justification, etc. As previously mentioned, there is a difference between the FADN core and the Italian FADN in terms of number of information gathered at farm level. Beyond the highest detail of technical and economic data, more emphasis is given to the environmental and social aspects related to the farm management. It is highly likely that the current information content of Italian FADN may be able to cover the future need of the survey in terms of sustainability. However, there is room for improvement in terms of how the information is collected and how the quality of data can be improved. Moreover, the possibility to integrate the system with other administrative databases is considered a further element of enhancement.

The following paragraphs focus on the most important environmental and social variables included in FADN, what is currently collected and in what extent the quality of data could be improved. All the considerations came from an internal discussion of a working group established in CREA-PB including all the subjects involved in the survey (the staff involved in the collection, validation, transmission of data to EU Commission and in the FADN IT development and data management system).

3.1. Environmental sustainability

Environmental sustainability in agriculture is a very wide concept, declined in various aspects related to the contribution to climate change mitigation and adaptation, the production and use of sustainable energy,

the efficient management of natural resources (water, soil, and air), the protection of biodiversity, etc. In agriculture, the sustainability is also linked to the emerging concept of sustainable food, resulting from the reduction of pesticide use, the limitation of antibiotics in livestock farming system, the enhancing of EU quality certification schemes (like organic labelling or territorial marks).

Gathering information on environmental variables is one important issue in FADN. Compared to the EU survey, the Italian system is characterized by a higher detail (Table 2). Italian FADN provides data about the water volumes of irrigation and fertigation as well as the unit of nitrogen, phosphorus, and potassium (NPK), for the farm as a whole and in the single production processes. Another important environmental information regards the indication of the toxicity categories for the crop protection products and some environmental characteristics of the farm management. Moreover, Italian FADN gathers more detailed information about the use and production of renewable energy.

Table 2 - Environmental variables in FADN: a comparison between EU and IT FADN

| Environmental variables | EU FADN | IT FADN |
|--|---------|---------|
| Georeferencing farms | ✓ | ✓ |
| Irrigated UAA | ✓ | ✓ |
| Water volumes of irrigation and fertigation | | ✓ |
| Amount of N, P and K used on the farm | ✓ | ✓ |
| Unit of N, P and K used in a single crop | | ✓ |
| Use of crop protection products (<i>toxicity class</i>) | | ✓ |
| Crops for energy use | ✓ | ✓ |
| Type of land use (<i>minimum tillage/no-tillage</i>) | | ✓ |
| Cover crop (<i>e.g., date of seeding, date of harvest</i>) | | ✓ |
| Environmental constraints – UE water directive | ✓ | ✓ |
| Environmental constraints – nature 2000 area (SPA-SCI) | ✓ | ✓ |
| Details on the use and production of renewable energy | | ✓ |

How these variables are collected and how their quality could be improved or integrated is a part of the discussion.

- *Water use*: information regarding water is considered crucial for the assessment of environmental sustainability and the estimation of

water footprint. The Italian FADN collects several data such as cost, consumption, supply sources (basins, streams, groundwater, consortium network, etc.), uses (livestock, crops, other). Irrigable and irrigated area is also indicated. The volume of water distributed per cultivation and the irrigation period is an additional information. However, water volumes are not always easy to gather especially when the farm has not counters or other measurement systems. With this respect, the survey could be improved evaluating the opportunity of deriving the information from the water requirements of the irrigated crops. Otherwise, a targeted survey on a sub-sample (limited to the most important cultivations) could be defined.

- *Nitrogen, phosphorus, potassium (NPK) in fertilizers*: the quantity, cost, and title (in terms of FADN, when required) of around ten different types of fertilizers is an important information collected at farm level. In the Italian FADN the cost is also allocated among the different crops to calculate the gross margins. Regarding this procedure, the survey could be improved adding the allocation of fertilizers in terms of NPK quantity: it could permit an evaluation of the distribution of chemical elements per hectare and type of crop to perform spatial and temporal analysis of fertilization methods over time. The integration of this data with the nitrate vulnerable zones mapped at municipal level could be interesting for specific analysis.
- *Pesticides and crop protection products*: Italian FADN classifies several typologies of pesticides (around 10 including fungicide, herbicide, acaricide, plant growth regulator, insecticide), gathering information in terms of quantity and cost (the cost can be referred to the whole farm or allocated to the single production process). The active ingredients and the concentration are not gathered but the system requires the indication of the toxicological category. Although the importance to have this information, the collection is not always easy because of problems regarding the measurement unit and the toxicological category that sometimes can differ for the same product (depending by the formulation: powder, liquid, emulsion, etc.). Moreover, the knowledge of the treated area would require additional information because the data is referred to the total farm (Uthes *et al.*, 2019). A possible way for overcoming these difficulties could be a provision of a database containing all the commercial products with the respective formulations, and their active ingredients. In this way, the quantity and cost will be gathered at farm level and the key information regarding the quality of pesticide could be derived by this integrative tool.
- *Soil erosion, organic matter, and soil management*: for each crop, Italian FADN indicates the type of land use (for instance tillage, conservative farming) but specific information regarding soil management is not collected despite the importance in terms of environmental sustainability. Including this data is difficult mainly because agricultural practices do not

fall within the scope of an accounting data network. However, it would be possible to investigate this aspect integrating FADN with other database or providing for a targeted questionnaire for an eventual sub-sample of farms.

- *Energy use and production of renewable energy*: this is a wide topic that concerns both consumption and production at farm level. On the consumption side, Italian FADN collects information about quantity and cost of motor fuel, heating fuel, and electricity. In addition, it is collected the typology such as gasoline, diesel, methane gas and so on. Regarding the production of renewable energy, the main source is indicated (solar, wind, biomass energy) together with the output in terms of quantity, revenue, and income.

3.2. Social sustainability

In the scientific community, sustainable agriculture is commonly examined regarding the environmental problems in terms of natural resource conservation or considering the need for more resource efficiency. More complicated is the assessment of the social dimension of sustainability: although the advance in this field (Janker *et al.*, 2019; Eizenberg and Jabareen, 2017; McKenzie, 2004), is not completely clear what this concept should entail, depending on different actors' interests and goals. Current research on the social dimension of sustainability addresses several fields, different levels and employs various conceptual approaches: development studies, political studies, project development, business, and management, etc. (a short literature review is described in Janker *et al.*, 2019). Moreover, farm sustainability assessment tools and scope of the analysis vary widely, indicating the need for a common understanding of the social dimension of sustainability in agriculture (Janker and Mann, 2018).

The main goal of a farm is the production and the income maximization even if farmers decisions are driven also by non-monetary issues including social benefits (Howley, 2015). While FADN permits easily to perform income or profitability analysis, social aspects are difficult to assess because EU Farm Return does not collect enough information suitable to be used for these purposes.

What kind of social relationship is possible to analyse within FADN survey? An interesting conceptual frame that could be adapted to this scope has been developed by Janker *et al.* (2018). According to this vision, the agricultural social system has its basis in the actors and their interactions: the central element is represented by all the stakeholders involved directly or indirectly with the agricultural processes, interacting in the farm sphere but also outside.

These interactions can change over time and can be divided in institutionalized interactions (specific relationships, contracts, partnerships, agreements, etc.) or institutional embedding (like norms, traditions, legal system regarding work and workers, etc.). There is a mutual influence among all the elements: some of them directly influence the agricultural production activities while others influence and are influenced by other systems.

This partition serves as a tool for the classification of the social data on farming collected by the Italian FADN and, eventually, for an additional (or parallel) data collection addressed to a more accurate social sustainability assessment.

In this model, the agricultural system is divided in two subsystems, internal and external.

The internal agricultural social subsystem is developed inside the farm and is described by all the data focused on the actors involved in the agricultural process: farmer, family members, employees, seasonal workers, etc. The external agricultural social subsystem is the surrounding system of social interactions that can influence directly or indirectly the farm. Individuals or companies connected with farm inputs, output, logistic, employment, advisory services, etc. have a direct influence and their interactions, being based on work aspects or monetary transactions, can be monitored with a data collection. Monitoring the direct influence of not-farming activities is more difficult: interactions with family members, friends, colleagues, organizations can influence the private life of the farmer and his/her family and, to some extent, contribute to the integration in the local community, considered an important factor of well-being (McManus *et al.*, 2012) and an indicator of social sustainability.

Indirect influence on the agricultural social system is exerted by all the mechanisms acting as farmer's motivation, focused on the expectations and on local institutions norms and values: behaviour to avoid specific sanctions, attentions to the food security and environment and not only to profit maximization, attention to the animal welfare and food quality, understanding of the choice of food products or the reputation of specific production systems, etc. All these aspects cannot be directly monitored in FADN, but their understanding require the evaluation of the general territorial system in which the farm operates.

Having in mind this framework of the social aspects influencing the agricultural activity, is possible to define and select quantitative indicators that refers to social sustainability and that can be collected within FADN (or specific farm surveys, like in Gaviglio *et al.*, 2016). In the following points, the social data are described, grouped by sub-theme, together with a consideration about the need and opportunity to strengthen the survey in future.

- *Description of farmer and family members*: the internal agricultural social subsystem is defined first by the actors directly involved in the production. The Italian FADN collects information regarding the relationships among all the family farm members and this permits to describe specific characteristics of the farmer, the role (he/she could be employed full-time or part-time; he/she could be retired; he/she could work alone in the farm or not, etc.) and the role of family members (common or specialized worker, manager, not employed in the farm activities, etc.). They can be employed in the farm at full-time or occasionally (harvesting period, for instance) or have an off-farm income. Age is also indicated for all members, and this should be an indicator for the generational renewal analysis.
- *Ownership*: the bonds between farmer and farm can be additionally described with this information regarding the type of ownership, the legal status, the level of liability of the holder, the share of rented agricultural area on the total, the rents paid, etc.
- *Gender balance*: gender is recorded for holder/manager, all the family members, other employees, and seasonal workers (as number of women employed seasonally out of the total). It is an information useful to perform comparative analysis for the profitability in farms run by women versus farms run by men or to better understand the importance of the women component in specific territories or type of farming.
- *Agricultural training*: it is another important variable suitable to be used in the description of the farmer characteristics but also as input to investigate the external agricultural social subsystem. Training is a key aspect for the growth of the agricultural sector and the requirement of high-profile skilled job in the farm activities can be considered as an important driving force of the development and innovation process of the territory. Italian FADN collects information regarding the qualification of the farmer and family members in terms of general level of education and this is not completely aligned with the EU requirements, based mainly on the distinction among practical experience only, basic training and full agricultural training. This last aspect is very interesting in terms of social sustainability because gives a measure of the territorial capacity to influence skills and expertise of farmers. The identification of targeted agricultural training and the subjects covered could be an additional indication of the efficiency of the local institutions. This variable is under revision, and it will be improved in future.
- *Advisory services*: the cost for advisors is gathered (as required by EU Regulation) while the information about the kind of advice is not specified. It could be added in the survey as an indicator of the relationship between internal and external agricultural subsystems but also as an indicator of the

local capacity to meet the farmer needs not only in the traditional fields (like crop management or animal husbandry) but also in advice relate to innovation, environmental protection, social aspects, commercialization, etc. Moreover, it should be used as indicator in case of impact analysis of some RDP measures.

- *Interaction with local Organizations, social involvement, and responsibility*: cooperation, association, social involvement in local groups, memberships in local organization, consortia or other production structures are considered as important indicators of human development in rural areas. In the Italian FADN there is not a specific investigation and only a minimum set of qualitative data are collected with regard the affiliation to local Producers Organizations or consortia. The survey could be enhanced obtaining information on these aspects from the whole sample.
- *Labour input and costs*: number of hours, number of workers (in term of persons and Annual Work Units), wages and social security costs for paid labour are collected by the Italian FADN. The ratio between unpaid and paid labour or the regular versus casual labour is an indicator of the work patterns.
- *Source of income*: the farm income can be seen as the sum of agricultural income, income coming from other gainful activities (OGA, described in detail) related to the holding and off-farm income (not required by EU Regulation). All the information regarding these aspects is collected by the Italian FADN and often is considered in the analysis based on the diversification and multifunctionality of farm activities.
- *Production quality, certifications, retail channel*: the relationship between producers and consumers can be identified as an external interaction having direct and indirect influence on the farmer behaviour. Traditions, local economies, trust in producers, etc. are important elements recognized as social attributes by the literature (Bessi re, 1998; Seyfang, 2006; Gaviglio *et al.*, 2016). The presence of certifications and the retail channel chosen by the farm also give indications about the link between the farm and the territory. Italian FADN collects data on several kind of certifications (not only the territorial marks like PDO, PGI, TSG) but also on organic agriculture and different other kind of certification (included the environmental ones). Regarding the retail channel, this information is collected but it must be improved adding to the traditional channels already detected, further systems like short food supply chain, direct sales, online sales, canteens, restaurants, ethical purchasing groups, etc.
- *Connectivity and information systems*: the future of agriculture is in the connectivity, ability to share information and data across devices, improvement in the information system, etc. These elements will serve to increase the capacity of farmers in increasing their productivity but also in

strengthening the interaction with social network, extension and advisory services operating agricultural technology. Italian FADN does not collect this information, highly recommended for the future implementation.

Final remarks

The launch of a Farm Sustainability Data Network (FSDN), more oriented to incorporate the three dimensions of sustainability, will permit to reach several objectives partially covered by the current accounting system. At EU level, it will permit to increase the environmental and social information regarding the farm activity and, to some extent, to analyse synergies and/or trade-offs between economic and environmental outcomes of farming practices. If well developed, FSDN will provide data-based discussion tools for farmers and advisors, helping them to become more sustainable by identifying bottlenecks and best practises. Finally, it will be a key data source to monitor the progress towards Farm to Fork and Biodiversity targets.

FSDN principles move in the same direction of FADN: the new survey will maintain and improve the current role of FADN as the only source of harmonized microeconomic farm level data in the EU and as the reference source of data for income related Performance Monitoring and Evaluation Framework (PMEF) indicators. By adding the environmental and social dimension of sustainability, FSDN will reinforce the analytical and political relevance of FADN: an enhancement of the use of data in farm advice benchmarking, training and innovation could reinforce farmer's incentives to participate in FSDN. Moreover, it will improve linkages with existing data collections adding new variables not available elsewhere.

However, the shift into a more detailed system as FSDN has also some constraints. The excessive increase of variables could result in collapsing of the whole idea of FSDN. Particular attention must be paid to (i) farmers' willingness to participate (already now countries are facing serious problems in recruiting enough farms for participation in FADN, particularly bigger farms); (ii) resistance by Member States (it will be important to involve policy makers from agricultural and environmental ministries and organizations); (iii) additional resources: requirements in terms of changes of the IT infrastructure, data collection and verification processes will take additional budget and staff, new resources and new ways of collecting data in Member States.

Theoretically, the current Italian FADN system appears to be more oriented to satisfy some environmental and social informative need respect to the EU FADN. However, having the Member States the faculty to add

the survey of specific variables, further efforts could be done to enhance the actual system. This can be realized according to several hypothesis:

- adding (or improving) a core set of new variables to the Italian Farm Return gathered every year to all the farms participating in FADN;
- defining supplementary modules focusing on specific aspects identified in the survey, addressed to the whole FADN sample or selecting a sub-sample (one specific agricultural sector, farms located in mountain, farms with OGA, etc.) depending on the scope of the analysis;
- selecting satellite samples focusing on specific aspects not traditionally covered by the FADN topics.

One important methodological aspect related to the future survey will be the opportunity to integrate the collection in the current FADN structure or to opt for supplementary modules or sub-samples. Advantages and disadvantages are resumed in Table 3.

Table 3 - Advantages and disadvantages of collecting sustainability data in FADN or in a supplementary module or separate sample

| Integrated data collection in the current FADN scheme | Supplementary module/separate sample |
|---|--|
| (+) Trade-off between objectives/ indicators | (+) Selectiveness and possibility to optimise the survey design for specific variables |
| (+) Integrated policy analysis | (+) Reliability: more accurate information and more reliable estimates |
| (+) Use of existing procedures and data management | (-) No link with economic performance or policy measures in case of supplementary modules on satellite samples |
| (-) Increased complexity of data collection (number of variables, data collectors' skills) | (-) Time and resources to establish supplementary modules |
| (-) Possible need to reconsider fields of observation and complication of the sample design because of a wide variety of objectives | (-) Availability of data collectors to gather further information |
| (-) Need for re-adjusting current systems and working processes (online tools, supplementary modules) | (-) Costs of the supplementary modules |
| (-) Higher cost of the survey | |

Source: Vrolijk (2016), adapted.

The supplementary modules will require an IT adaptation. The software GAIA, ought to become an online tool (GAIASWeb), will include the new variables and a parallel upgrading of the data check and validation methodologies. The annual training for data collectors will be targeted to include the environmental and social aspects of farm activity. The economic consequences of these changes should be also evaluated: most likely the integration of variables, modules or satellite samples will require a higher cost for the survey.

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