Ecological Indicators xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Ecological Indicators

journal homepage: www.elsevier.com/locate/ecolind

Original Articles

Sustainability indicators for improved assessment of the effects of agricultural policy across the EU: Is FADN the answer?

Edel Kelly[a,*], Laure Latruffe[b], Yann Desjeux[b], Mary Ryan[c], Sandra Uthes[d], Ambre Diazabakana[b,e], Emma Dillon[c], John Finn[f]

[a] School of Agriculture & Food Science, University College Dublin, Belfield, Dublin 4, Ireland
[b] INRA, SMART-LERECO, Rennes, France
[c] Teagasc, Rural Economy & Development Programme, Athenry, Co. Galway Ireland
[d] Leibniz Centre for Agricultural Landscape Research (ZALF), Muencheberg, Germany
[e] Vertigo Lab, Bordeaux, France
[f] Teagasc, Crops Environment and Land Use Programme, Johnstown Castle, Co Wexford, Ireland

ARTICLE INFO

Keywords:
Sustainability
Indicators
European union
Farm accountancy data network
Rural development programme

ABSTRACT

Policy reform of the CAP and society's expectations of agriculture have resulted in a growing need for improved information on the effectiveness of policy in achieving high-level objectives for more sustainable practice in agriculture. This is a high priority given its importance for consumers, public policy and private industry. Data collection programmes will need to adapt their scope if their information is to adequately address new information needs about high-level objectives. Assessment of sustainability at the farm level is hindered by the lack of data with which to derive appropriate, meaningful, and relevant indicators. This is particularly problematic for assessment of agricultural sustainability across the European Union (EU). Various databases exist at the EU scale regarding agricultural data sources and we identify one of these, the EU Farm Accountancy Data Network (FADN), as having considerable potential to assess farm-level sustainability at EU level. We critique several examples of published work that has attempted to assess agricultural sustainability using: FADN data alone; FADN data in combination with data from supplementary surveys, and; FADN data in combination with data from other EU databases. We conclude that the FADN would need to broaden its scope of data collection if it is to address the new information needs of policy, and we discuss the challenges in expanding FADN with a view towards wider farm-level assessment of sustainability. These include careful selection of indicators based on various criteria, the representativeness of the FADN, and the need to include new themes to address environmental, social, and animal welfare effects of policy.

1. Introduction

Global demands for finite resources have prompted governments to increasingly promote sustainable choices and actions in society. However, to meet these global demands, agricultural food production must increase, thus the impact of the sustainable intensification of agriculture and natural resource usage on the environment is central to any debate on sustainability (Teillard et al., 2016). However, there has been considerable variation in terms of how sustainability in agriculture is defined (Latruffe et al., 2016a,b; Hayati, 2017). Viewed from the perspective of the farm, the contribution to sustainable agriculture encompasses the production of goods and services (economic dimension), the management of natural resources (ecological dimension) and the contribution to rural communities (social dimension). Movement towards sustainability will necessarily involve simultaneous progress along these interconnected dimensions.

There is also variability in how sustainability is pursued in the policy-making process (Binder et al., 2010). For example, the European Commission has included three priorities in its Europe 2020 strategy, one of them being *'Sustainable growth: promoting a more resource efficient, greener and more competitive economy'* (European Commission, 2010a) and also recognises that agriculture delivers *'multiple economic, social, environmental and territorial benefits'* (European Commission, 2010b). These priorities are reflected in changing policies which seek to encourage the provision of environmental and social benefits from agriculture in rural areas, through agri-environment schemes (AESs) and

* Corresponding author. Postal address: 1.22 Agri-Business and Rural Development, School of Agriculture & Food Science, University College Dublin (UCD), Belfield, Dublin 4, Ireland.
E-mail addresses: edel.kelly@ucd.ie (E. Kelly), laure.latruffe@inra.fr (L. Latruffe), yann.desjeux@inra.fr (Y. Desjeux), mary.ryan@teagasc.ie (M. Ryan), uthes@zalf.de (S. Uthes), ambrediazabakana@vertigolab.eu (A. Diazabakana), emma.dillon@teagasc.ie (E. Dillon), john.finn@teagasc.ie (J. Finn).

https://doi.org/10.1016/j.ecolind.2017.12.053
Received 24 August 2017; Received in revised form 24 November 2017; Accepted 22 December 2017

more recently, through European Innovation Partnerships (EIPs). As policies broaden so too must policy evaluation, taking into account not only the provision of food (market) goods and the impact on the environment and natural resources, but also the more intangible (public) goods delivered by agricultural food production, such as rural vitality and the maintenance of rural heritage and traditions (Cooper et al., 2009).

Sustainability can be assessed at different scales, such as global, local, sector-specific, individual (farm or household) and site-specific (e.g. plot). In agriculture, assessment of sustainability at the farm level is common (e.g. see the international initiative 'Sustainability Assessment of Food and Agriculture systems' by the Food and Agriculture Organisation (FAO) (FAO, 2013a, 2013b), for several reasons. Firstly, the individual (farm) level is the most important spatial unit in terms of the implementation of sustainable actions, as farmers operate at this scale and management decisions can be directly influenced through interventions for improved implementation. Secondly, although indicators of sustainability can be developed at various levels including regional and national levels, the farm-level approach increases the spatial accuracy of indicators, which is highlighted as a main challenge (Burkhard et al., 2009). Finally, the farm is the legal unit for legislative purposes and the economic unit that generally receives payments for externalities, and as such is the level at which most policies are directed (OECD, 2001).

In general, farm-level assessments of sustainability are carried out at a small scale within a specific case study setting (e.g. de Koeijer et al., 2002; Dolman et al., 2012; Mollenhorst et al., 2006; Moreno-Pires and Fidélis, 2012; Thivierge et al., 2014; Zahm et al., 2008), and therefore findings may not always be generalizable to wider scales. This is particularly problematic in meeting high-level data needs to evaluate policy questions across the European Union (EU). Although several databases currently provide agricultural data at the EU scale, the challenge associated with measuring the economic, environmental and social dimensions of sustainability is the availability of data that reflect all three dimensions, while also being robust and representative across Member States (MS) to enable cross-country assessments of EU policies.

This paper suggests that one data source, namely the EU Farm Accountancy Data Network (FADN), has considerable potential to assess farm-level sustainability across all three dimensions on an EU-wide basis. The aim of the paper is two-fold: to show that the FADN is already widely used to assess farm-level sustainability (with limitations) and to demonstrate that although the FADN is primarily oriented towards economic issues, it offers (with modifications) an appropriate platform to represent many of the economic, environmental and social dimensions of agricultural sustainability, while also facilitating EU-scale assessment. First, we set the general context for this study before focusing on FADN as a data collection mechanism for agricultural production in the EU. Through some examples, we then examine the current potential of FADN data to assess farm-level sustainability. The limitations and the challenges afforded by FADN for a broader assessment of sustainability are discussed and conclusions are drawn.

2. Rationale and background

2.1. Usefulness of farm-level sustainability indicators

Sustainability in agriculture can be considered as a prerequisite for transition to sustainable development at the global level. The application of the concept of sustainable development in agriculture raises interest in both the sustainability of the agricultural system itself and its contribution to sustainable development (Bockstaller et al., 2009). It thus incorporates the principal dimensions and objectives of sustainability when sustainable practices are implemented on a given agricultural system (Schaller, 1993; den Biggelaar and Suvedi, 2000; Gafsi et al., 2006). In assessing sustainability, the individual farm is considered the most appropriate spatial unit in terms of the implementation of sustainable farm activities. This is reinforced by the Common Monitoring and Evaluation Framework (CMEF) for the 2007–2013 Rural Development Programme (RDP), which provides guidance on various common indicators and a single framework for monitoring and evaluating all rural interventions across EU MS (European Commission 2003, 2015; Uthes et al., 2017) and recommends data collection at an individual (i.e. farm) level (European Commission, 2010c).

In relation to their usefulness, farm-level sustainability indicators can be used to monitor farm activities to assist in decision-making and assess progress towards more sustainable farming (Vilain, 1997) and decision support and sustainability assessment tools based on indicators have been developed by researchers and private value-chain stakeholders (e.g. Murphy et al., 2013; de Olde et al., 2016). These indicators can be used to improve the understanding of the relationship between the environmental, economic and societal impacts of agricultural activities.

Sustainability indicators are also useful in comparing farm performance and benchmarking across farms. Previous research has proven the effectiveness of benchmarking (the process of identifying, learning from and adapting better practices from other farmers) in improving farm performance, efficiency, sustainability and profitability (Kahan, 2013; Kragten and de Snoo, 2003). Sustainable value methods which provide scores to farms are common and can be used to set targets, but functional units can also be used to compare farms (Lebacq et al., 2013), for example the expression of environmental impacts, such as emissions per product (Hennessy et al., 2013) or emissions on a per hectare basis (Buckley et al., 2016).

Sustainability indicators are also widely used for policy design and evaluation (both public and private policies) and for meeting industry quality standards (by individual farms) at different scales of implementation. Indeed, linkages that exist between policies, agriculture and the environment are complex, and vary across countries and policy contexts. Policy makers require appropriate and relevant indicators to evaluate ex-ante policy scenarios, to design/improve (new) policy measures and to evaluate policy instruments.

At the EU level, the Common Agricultural Policy (CAP) is one of the only policies for which periodic evaluations are required by the European Commission. Since its inception in the 1960s, the CAP has undergone several reforms. The 1999 reform ('Agenda 2000') split the policy into two different pillars as policy measures devoted to agricultural production were gathered under Pillar I, while rural development was dealt with under Pillar II through the RDP (European Commission, 2003). The 2003 (Luxembourg) reform introduced three compulsory RDP evaluations per 7-year programming period (i.e. *ex-ante*, *mid-term*, and *ex-post* evaluations), with a consequent increase in the demand for suitable data and relevant indicators.

To summarise, the CAP has evolved greatly, particularly over the last 10–15 years, with the primary focus moving from increasing agricultural productivity through market and income stabilisation, to objectives that include viable food production, the sustainable use of natural resources, mitigation of climate change and balanced territorial development. The most recent CAP (2013) reform specifically addressed commitments to economic, social and environmental sustainability with the RDP oriented towards improved competitiveness of agriculture, sustainable management of natural resources and climate action, and a balanced territorial development of rural areas (ENRD, 2015). The goal is 'no longer simply to maximise productivity but to optimise across a far more complex landscape of production, rural development, environmental, social justice and food consumption outcomes' (Pretty et al., 2010). Given increasing reporting requirements for policy planning, implementation, evaluation and impact assessment, existing monitoring and data collection systems must also evolve to take account of new policy topics such as risk stabilization funding as well as information on plant health and animal welfare. Thus, MS are confronted with new measurement and evaluation needs which are