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Assessing sustainability at farm-level: Lessons learned from a comparison of tools in practice

Evelien M. de Olde[a,c,*], Frank W. Oudshoorn[a,b], Claus A.G. Sørensen[a], Eddie A.M. Bokkers[c], Imke J.M. de Boer[c]

[a] Aarhus University, Department of Engineering, Inge Lehmanns Gade 10, 8000 Aarhus, Denmark
[b] SEGES, Agro Food Park 15, 8200 Aarhus N., Denmark
[c] Animal Production Systems Group, Wageningen University, P.O. Box 338, 6700 AH Wageningen, The Netherlands

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ABSTRACT

In the past decades a wide variety of tools have been developed to assess the sustainability performance of farms. Although multiple studies have compared tools on a theoretical basis, little attention has been paid to the comparing tools in practice. This research compared indicator-based sustainability assessment tools to gain insight in practical requirements, procedures and complexity involved in applying sustainability assessment tools. In addition, the relevance of the tools, as perceived by farmers, was evaluated. An overview of 48 indicator-based sustainability assessment tools was developed to, subsequently, select tools that address the environmental, social and economic dimension of sustainability, are issued in a scientific publication and suitable for assessing the sustainability performance of livestock and arable farms in Denmark. Only four tools (RISE, SAFA, PG and IDEA) complied with the selection criteria and were used to assess the sustainability performance of five Danish farms. The tools vary widely in their scoring and aggregation method, time requirement and data input. The farmers perceived RISE as the most relevant tool to gain insight in the sustainability performance of their farm. The findings emphasize the importance of context specificity, user-friendliness, complexity of the tool, language use, and a match between value judgements of tool developers and farmers. Even though RISE was considered as the most relevant tool, the farmers expressed a hesitation to apply the outcomes of the four tools in their decision making and management. Furthermore, they identified limitations in their options to improve their sustainability performance. Additional efforts are needed to support farmers in using the outcomes in their decision making. The outcomes of sustainability assessment tools should therefore be considered as a starting point for discussion, reflection and learning.

1. Introduction

Agricultural production significantly contributes to, for example, climate change, water pollution, and loss of biodiversity, and increasingly competes for natural resources, such as land and phosphorus (Steinfeld et al., 2006). Moreover, social concerns arise about the impact of agricultural production on public health and animal welfare, and diminishing farm profitability (Bos et al., 2009). The urgency of sustainable development of agricultural production, therefore, is increasingly acknowledged (Pretty, 2008; Tilman et al., 2002; Wiskerke, 2009). To enable a transition towards more sustainable production, a wide range of tools have been developed to gain insight in the sustainability performance of agricultural systems (Binder et al., 2010; Schader et al., 2014). Indicator-based sustainability assessment tools vary widely in their scope (geographical and sector), target group (e.g. farmers or policy makers), selection of indicators, aggregation and weighing method, and time requirement for execution (Binder et al., 2010; Marchand et al., 2014; Schader et al., 2014). Although many stress the importance of integrating environmental, economic and social themes in sustainability assessment tools, environmental themes and tools generally receive more attention (Binder et al., 2010; Finkbeiner et al., 2010; Lebacq et al., 2013; Marta-Costa and Silva, 2013; Schader et al., 2014).

* Corresponding author at: Aarhus University, Department of Engineering, Inge Lehmanns Gade 10, 8000 Aarhus, Denmark. Tel.: +45 23360087.
E-mail address: evol@eng.au.dk (E.M. de Olde).

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1.1. Hierarchical structure in sustainability assessment tools

Indicator-based sustainability assessment tools are generally structured following three or four hierarchical levels (Fig. 1). A wide diversity of terminology, however, is used to define the various levels (Fig. 1) (Bausch et al., 2014; Bélanger et al., 2012; De Boer and Cornelissen, 2002; Guerci et al., 2013; Haas et al., 2000; van Calker et al., 2007; Van Cauwenbergh et al., 2007). This paper follows the structure suggested in the SAFA guidelines (FAO, 2013). A dimension is a pillar of sustainability and is the highest and most general level in the structure of a tool. On the intermediate level, universal sustainability goals are translated into themes and, in some cases, made more explicit in subthemes. Finally, indicators are measurable variables to evaluate the sustainability performance for the (sub) theme (FAO, 2013). The indicator value can be derived in different ways, e.g. through measurement, expert opinion or model estimates (Van Cauwenbergh et al., 2007). To evaluate the indicator value, a desired level for each indicator is described by means of a reference value (Acosta-Alba and van der Werf, 2011; Van Cauwenbergh et al., 2007). Reference values can be absolute or relative values. Absolute values can be divided into target values identifying a desirable condition (e.g. legal norm), and threshold values defining a minimum or maximum acceptable level (e.g. political interpretation of scientific findings) (Van Cauwenbergh et al., 2007). Relative reference values compare indicator values with an initial value, regional or sample average or desirable trend (Lebacq et al., 2013; Van Cauwenbergh et al., 2007).

1.2. The adoption of sustainability assessment tools in practice

Sustainability assessment tools can provide support to on-farm decision making and hereby may have a significant impact on a sustainable development of farms (Le Gal et al., 2011; Marchand et al., 2014). So far, however, the actual adoption of sustainability assessment tools by agricultural practice is relatively limited (Binder et al., 2010; Triste et al., 2014). In the development of a sustainability tool, tool developers make value judgements and assumptions, for example, on what is sustainability, what is a sustainable level of production, which indicators to select, and how to measure, weigh and aggregate the indicators (Gasparatos, 2010). A mismatch between these value judgements and assumptions of tool developers and its users (i.e. farmers and advisors) can result from insufficient involvement of these users during the development of a tool, and is considered as a reason for the limited adoption of sustainability assessment tools in farming practice (De Mey et al., 2011; Gasparatos, 2010; Triste et al., 2014; Van Meensel et al., 2012). Furthermore, data availability and quality, time and budget requirements as well as factors related to unfamiliar terminology, user-friendliness, and tool accessibility influence the farmers' perception of the tool's relevance and, consequently, the adoption of tools (Lynch et al., 2000; Marchand et al., 2014; Van Meensel et al., 2012).

Farmers' adoption of sustainability assessment tools and their outcomes is a key issue when considering to use sustainability assessment tools to contribute to the sustainable development of farms (Triste et al., 2014). Literature on the adoption of tools by farmers emphasizes the importance of the perceived relevance of the tool which is determined by a combination of factors mentioned above (Van Meensel et al., 2012). Relevance can be defined as: '*Something is relevant to a task if it increases the likelihood of accomplishing the goal which is implied by the task*' (Hjørland and Christensen, 2002). As stated by McCown (2002) farmers cease to care about tools when they can't see sufficient value for action resulting from the output.

The aim of this study was to compare sustainability assessment tools in practice and discuss the relevance as perceived by farmers. The importance of such an end-user validation of sustainability indicators and methods was raised by Bockstaller and Girardin (2003). By applying multiple tools on farms, insights are obtained in the practical and operational requirements, procedures and the complexity involved in applying sustainability assessment tools in practice. This adds another dimension to existing studies focused on comparing tools on a theoretical basis. An overview of existing tools was developed to, subsequently, select tools that address the environmental, social and economic dimension of sustainability, focus at farm level, are issued in a scientific publication and suitable for assessing the sustainability performance of livestock and arable farms in North-West Europe. The tools were applied on five Danish farms as a case, and compared using the framework of Marchand et al. (2014), adapted from Binder et al. (2010).

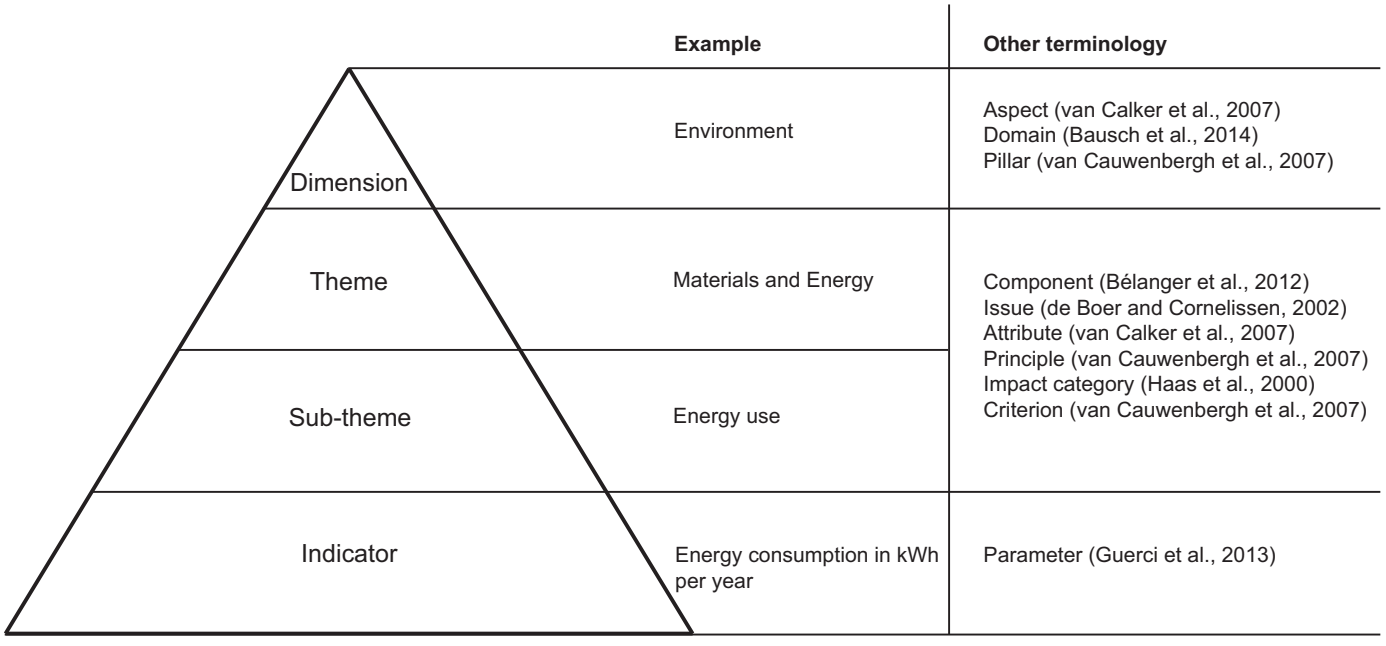

Fig. 1. Hierarchical levels in sustainability assessment according to SAFA as used in the present study, and terminology used in other sustainability assessment studies.