A comparison of complex expert-based assessment versus quickscan assessment

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Abstract

Past decades, various sustainability assessments emerged, ranging from very complex expert-based assessments to quick scan ones. The former type is based on expert information and an extensive data demand, the latter on information gathered instantly from the farmer. This research compares both types while using the following criteria: i) the design approach and characteristics, ii) the critical succes factors for implementation put forward by De Mey et al. (2011), iii) results in the field and evaluation by the end-users. As an example for an expert-based assessment, we used MOTIFS (Meul et al. 2008) designed for dairy farming in Flanders. We applied this tool on Flemish dairy farms within the EU-Interreg project Dairyman. The OCIS Public Goods tool (Gerard et al. 2011), designed for organic dairy farms in Great Britain was used as example of a quickscan method. During the EU project SOLID, the tool was adjusted for the entire European region and applied on organic dairy farms. This research determines the strenghts and weaknesses of both types of sustainability assessment systems. This will result in suggestions on which type of sustainablity assessment is relevant depending on the case, related to the critical succes factors such as attitude of model users, time and data availability, user friendliness, communication aid, etc. Researchers and practitioners can use this information when developing or selecting, and possibly modifying, an appropriate tool for their goals.

1. Introduction

Sustainability in agricultural systems is considered as an important and essential condition for the transition towards a sustainable development (OECD, 1999), in this transition proces assessments are viewed as a signifcant aid (Poppe *et al.,* 2004). A growing number of different integrated sustainability assessment (ISA) tools and frameworks have been developed in order to support decision making in agriculture (Gasparatos, 2010). These assessment tools are designed for application at a specific level ranging from farm over sectoral to regional and national level (Binder *et al.,* 2010). Our research, we will focus on assessment approaches aimed at farm level. Some examples are illustrated in Table 1.

Table 1. Examples of assessments at farm level

Approach	Aim	Target group	Type of data information
IDEA (Zahm *et al.*, 2008)	To provide an operational tool for sustainability at farm level	Planners, policy makers, researchers, farmers and farmer organizations	Self-assessment tool
MOTIFS (Meul *et al.*, 2008)	To provide a user-friendly and communicative monitoring tool that allows the measurement of progress towards integrated sustainable dairy farms	Farmers and farmer organizations, Advisors	Expert-based, combination of expert information and detailed farm data
RISE (Grenz *et al.*, 2009)	To provide a simple and cheap but holistic tool to: 1.Evaluate the degree of sustainability at farm level 2.Visualize potentials and failures, thus inducing management responses	Farmers and farmer organizations	Scan by trained Advisor, combination of region available data and farmer knowledge
OCIS PG-tool	To provide a tool to assess the public goods provided by a farm	Advisors, Farmers	Scan by advisor, combination of accountancy data and farmer knowledge

The assessment tools differ in many criteria. In table 1 we show ”aim”, ”target groups” and ”type of data information”. Although the overall aim of these tools is to provide insights at farm level, the specific objectives are quite different and interlinked with the target group and type of information. From our experience with different tools in different national and international projects and an ongoing meta-analyse, one of the criteria which has a huge impact on the succes of the implementation is the type of data information (De Mey *et al*., 2011). On one side of the spectrum so called ’expert-based’ tools exist, which implies the use of extensive expert information and detailed data of the farm in the calculation of the different indicators (Meul *et al*., 2008). On the other side of the spectrum we find the ’quick scan’, which relies on readily available data, such as the accountancy data and current knowledge of the farmer (Gerrard *et al*., accepted). Implementation success of the first type may be hampered by the need for expert and excessive data monitoring efforts while a quick scan type may be criticized with arguments such as unsufficient scientific ground. Therefore, we focus in this paper on the comparison between an expert-based and a quickscan assessment through using more specific criteria: i) the design approach and characteristics, ii) the critical succes factors for implementation, and iii) results in the field and evaluation by the end-users. This approach must enable to determine the strenghts and weaknesses of both types of sustainability assessment systems. This will result in suggestions on which type of sustainablity assessment is relevant depending on the case. Researchers and practitioners can use this information when developing or selecting, and possibly modifying, an appropriate tool for their goals.

The paper is elaborated as follows. First (section 2), we clarify the two cases. Then we elaborate the comparison methodology in which the use of criteria is specified and motivated. Results of the case-specific comparison are given in section 4. Discussion (section 5) is focused on revealed strenghts and weaknesses. We conclude with suggestions on further ISA use.

2. Case-studies

As an example for an expert-based assessment, we used MOTIFS (Meul *et al.* 2008) designed for dairy farming in Flanders. We applied this tool on Flemish dairy farms within a national project "Melkveecafés" and within the EU-Interreg project Dairyman. Flemish dairy farmers, 19 in the first project and 12 in the second, took part in discussion groups with the attendance of an expert on the topic discussed. In both projects, the tool MOTIFS was used to provide a visual aggregation of sustainability indicator scores allowing for a holistic interpretation of the farm's overall sustainability. Through setting up these discussion groups, we created an environment which stimulated social learning between the participating farmers (Marchand *et al.,* 2010).

The MOTIFS case

The Integrated Sustainability Assessment (ISA)-model MOTIFS is an indicator-based sustainability monitoring tool for Flemish dairy farms. It allows us to monitor farm progress towards integrated sustainability, using a set of relevant indicators. The tool offers a visual aggregation of indicator scores into an adapted radar graph, considering ten sustainability themes related to ecological, economic and social aspects (Fig. 1). To aggregate the indicators for different sustainability themes, we defined benchmarks to rescale indicator values into scores between 0 (indicating a worst-case situation) and 100 (indicating assumed maximum sustainability). This allows for a comprehensive overview and mutual comparison of the indicators for different sustainability themes. MOTIFS is a visual multi-level monitoring tool. Level 1 gives an overview of the farm's overall sustainability (Fig. 1). Level 2 gives an overview of the sustainability themes within a specific sustainability dimension. In level 3, the indicator scores for a specific theme are visualised. So, starting from an overall view of his farm's sustainability, a farmer can zoom in on the underlying themes and indicators into as much detail as desired. The aim of MOTIFS is to guide farmers' management towards a higher level of sustainability. A detailed description of MOTIFS and its underlying methodology is provided by Meul *et al.* (2008).

Figure 1. MOTIFS, level 1 graph and instructions on the reading and interpretation (after Meul et al., 2008)

The OCIS Public Goods tool (Gerard *et al*., 2012), designed for organic dairy farms in Great Britain was used as example of a quickscan method. During the EU project SOLID, the tool was adjusted for the entire European region and applied on 10 organic or low input farms. The application consists of a farm visit of three to four hours.

The OCIS case

The OCIS Public Goods Tool incorporates a variety of public goods which may be provided by an agricultural enterprise which are defined and summarized through eleven "spurs". These spurs account for a range of benefits: social, environmental and economic. By means of these spurs the tool assesses each individual farm (Figure 2). For each spur a range of activities was selected based on discussion during a stakeholder workshop and a subsequent literature review. The scores for each spur are obtained by averaging the scores for all its activities. These are then shown on a radar diagram, allowing farmers to see in which areas they perform well and which areas could be improved. A bar chart showing the activities on each spur gives more detailed information, so if the farmer scores less on a particular spur they can identify the specific activities to work on to improve the score in the future.

Figure 2. Radar diagram showing the minimum, mean and maximum scores across all forty farms in the pilot assessment (Gerard *et al*., 2011)

3. Method

3.1. The design approach and characteristics

In order to evaluate the MOTIFS and OCIS tool on their design approach and characteristics, we use the framework proposed by Binder *et al*. (2010). This method separately analyzes the normative, systemic and procedural dimensions of the ISA-tools in order to reveal the strengths and weaknesses. By using this framework we explicitely separate three questions: i) how can the sustainability of the studied system be assessed (normative)?, ii) is a system properly described by the set of indicators used (systemic)?, and iii) how is the assessment carried out (procedural)?

Within the normative aspects, three issues are considered : i) the underlying sustainability concept, ii) the way of goal setting (transdisciplinary, top down or bottom-up) and iii) the assessment procedure (Scoring system, Reference values and thresholds, Stakeholder evaluation, Indicator ranges, Aggregation, Integration in one indicator). To obtain an adequate system representation, three issues should be considered when selecting the indicators to be used in the assessment: i) parsimony (as much simplicity as possible), ii) sufficiency (as much complexity as necessary) and iii) indicator interaction. With respect to the procedural dimension, the procedure itself and the stakeholder involvement is relevant. Following phases are considered: the preparatory phase, phase of indicator selection, measurement phase, the assessment phase and finally the application and follow up.

3.2. The critical succes factors for implementation

To evaluate the implementation of both ISA-tools, the critical success factors for implementation, suggested by De Mey *et al.* (2011), will be examined for both ISA-tools. These 10 success factors are listed in table 2.

Table 2. Critical success factors for implementation of ISA-tools (according to De Mey et al. 2011)

Critical success factor	Description
Attitude of model users towards sustainability	Values and beliefs of the model users (advisors and farmers) regarding sustainability issues
Compatibility	Extent to which the design and the proposed use of the tool is compatible with the data systems and institutional structure of accountancy/consultancy agencies
User-friendliness	Extent to which the ISA-tool is flexible and easy to use. This is related to the graphical design, ease of assessment and calculation (automation), etc.
Data availability	Availability of data necessary for indicator calculation
Transparency	Transparency of the used model and data (design, generalizations etc.) and transparency on uncertainties of model-derived results
Data correctness	Correctness of the data that are used to calculate the indicators of the ISA-tool
Communication aid	Use of ISA-tool in discussion sessions & its ability to support discussion on sustainability. Both communication aid of the model itself as communication through using it in farmer groups are included
Complexity	Degree of complexity of the ISA-tool
Organisation of discussion sessions	Practical organization of the discussion sessions with farmers. Which aspects need to be considered to make the discussion sessions more successful
Effectiveness	Extent to which the ISA-tool is perceived as being relevant to use and implement. By providing information and incentives to change, the use of the tool in farmer groups creates the possibility to communicate and undertake actions. The extent of this generates an added value in comparison with traditional systems.

3.3. Results in the field and evaluation by the end-users

At this stage, the implementation of both ISA-tools is carrying on.

4. Results

4.1. The design approach and characteristics

Normative aspects

The concept of MOTIFS was based on the Brundtland definition, while the goal setting was derived of a vision which was developed in a transdisciplinary dialogue with many stakeholders. The major principles of this vision were translated into 10 concrete themes by the researchers (top-down process). After an extensive literature review, indicators were developed in collaboration with experts and by consulting stakeholders and experts.

Because there is an increased interest amongst policy-makers in the question of whether farming provides a "public good" beyond the simple production of food, the OCIS tool was designed to provide a simple, measurable and accessible way to show the Public Goods that accrue through farming systems. The goal setting occurred with a key stakeholder group which resulted in 11 spurs.

Table 3. Normative aspects (according to Binder et al., 2010)

	MOTIFS	OCIS
NORMATIVE ASPECTS		
Concept	Sustainability concept of the Brundtland report (WCED, 1997)	Providing a "public good" beyond the simple production of food, which justifies support from EU agricultural policy
Goal setting during the design	Combination of transdiciplinary and top-down process	Bottom-up process
Assessment procedure	Indicators are normalized on a scale between 0 and 100 with different reference value methods. Aggregation into 10 components and 4 dimensions (ecological, economic, social and entrepreneurship).	Indicators are scored through farmer knowledge and range between 0 and 5, with reference values when available. Aggregation into 11 spurs, covering the 3 dimensions (ecological, economic and social).

Systemic aspects

In MOTIFS, the issue indicator interaction was taken into account through possible trade-offs. Both tools do not explicitly use parsimony or sufficiency as criteria for their indicator selection. However, the balance between these two criteria and the consequent system representation were addressed indirectly in MOTIFS through avoiding double counting. Also, system representation was included in the validation procedure with stakeholders during the design phase. In the OCIS PG-tool, data demands (qualitative and quantitative), necessary for indicator calculation of each spur, were selected to give sufficient in-depth information on the performance of the farm on that spur (sufficiency) while allowing the assessment to be carried out within two to four hours thus not taking up too much of the farmer's time (parsimony). The systemic representation was not questioned explicitly as the aim of the tool was addressing public goods provided by the farm.

Procedural aspects

During *the preparatory phase*, the user group is defined. MOTIFS has been used in discussion groups, which consisted of the participating farmers with the attendance of an expert. The OCIS PG-tool was used on an individual basis (farmer-advisor). As the indicator set is provided and not adaptable at time of implementation, there is no actual phase of *indicator selection* in both assessment tools. This means that agricultural sustainability goals are predefined, derived from either the definition of sustainability (in the case of MOTIFS) or the public goods (in the case of the OCIS PG-tool). During *the measurement phase*, we could observe a clear difference between both tools. MOTIFS comprises a set of indicators with data demands ranging from readily available to excessive and time-consuming data demands, contrary to the OCIS- PG-tool, in which all indicators are based on quickly available data. This results in a clear difference in total duration of the measurement phase between both tools. In the case of MOTIFS the duration includes at least two days, while in the case of the OCIS PG-tool this was only three to four hours. The specific data demand of MOTIFS creates the advantage that different farms are comparable with each other and that benchmarks can be developed. For the OCIS PG-tool this has to be handled more cautiously as more data are derived from questionnaires. When applied to different cultural and farming conditions, benchmarking is much more biased. The following *assessment phase* is discussed in the normative dimension and the case presentation above. *Application and follow-up* is related to the possibility for user groups to use the assessment results. MOTIFS results allow the farmers to situate themselves within a benchmark and provide the basis for identifying successful farm management practices. In a similar way, the OCIS PG-tool reveals the specific activities to work on to improve the score in the future.

4.2. The critical success factors for implementation

The critical success factors for implementation put forward by De Mey *et al.* (2011) are discussed for both MOTIFS and the OCIS PG-tool in table 4. The factors "*Attitude of model users towards sustainability*" and "*Organisation of discussion sessions*" are not present as both are external critical success factors not related to the tool. Also the factor "*Effectiveness*" is not yet discussed as the implementation of the two tools in the presented cases is still carrying on.

Table 4. Critical success factors for implementation of MOTIFS and the OCIS PG-tool

Critical success factor	MOTIFS	OCIS PG-tool
Compatibility	As the tool demands very specific and detailed data this can be a problem (a.o. lack of the right data in the accountancy system)	The tool demands quick available data and is therefore easy to use regardless of which accountancy system or institutional structure is present
User-friendliness	Data gathering takes different days and expert information is needed, the calculation is spread over different excel files	Results are immediately available from one excel file after an assessment which takes 3 to 4 hours
Data availability	For certain indicators, the data is very specific and an expert is needed to gather the correct data.	Uses data from the available accountancy system and from the knowledge of the farmer himself
Transparency	The use of benchmarks and the rescaling of the data conceals real numbers. Assumptions and generalization in the expert based indicators are not always transparent.	Al questions are scored between 0 and 5, and for each answer the score is visible in the excel file.
Data correctness	As specific data and expert information is used, the data are	As farmer knowledge is used, data can be biased by the farmer's

	generally accurate	perception
Communication aid	The graphical design is highly communicative, however it needs sufficient clarification when used at first	Mix of a graphical design and bar charts are communicative
Complexity	The tool aims to grab the complexity of sustainability while its graphical design tries to visualize this in a simple way. Therefore, the interpretation might be difficult and trade-offs are not always easy to identify	This tool does not aim to take in the complexity of sustainability but focuses on the public goods that a farm can provide.

4.3. Results in the field and evaluation by the end-users

At this stage, the implementation of both ISA-tools is carrying on.

5. Discussion

The analysis shows clear differences and, although case-specific, these differences enables to discuss the strengths and weaknesses of both tools.

The specific and large data demand of MOTIFS is both a strength and a weakness of the tool. As data collection is time-consuming, and if hired expertise is necessary, possibly also expensive, this might have negative effects on the critical succes factor data availability. Also processing the large amount of data is time-consuming and rather complex. All aformentioned issues reduces the user-friendliness of the tool and therefore the efficiency and the willingness to use the tool during the project. However, there are also significant strengths of this specific and large data demand in the MOTIFS tool, which is higher data accuracy. An additional strength of the MOTIFS tool is the system representation. As the complexity of the sustainability concept has been taken into account during its design, a well-considered system representation is guaranteed. Also, the different types of benchmarking, depending on the available data for each indicator, makes it highly suitable tool for comparing different farms. In conclusion, this expert based tool is precise and perfect for monitoring farms or evaluating different farming systems. As learning effects are low during data gathering, using the tool without participation in a discussion group of farmers focusses on monitoring. The learning aspect can be added by using this tool in discussion groups.

The data needed in the OCIS-PG tool, are easily available through surveying the farmer's knowledge. However, this can cause a bias in the data which are possibly less accurate in comparison to an expert based assessment. Furthermore, the score and benchmarking system is based on scientific literature, however not yet validated with expert information. This makes the tool less suitable for monitoring purposes and for comparing farms. Nonetheless, these quick scan tools are ideal to make a farmer think about different issues related to sustainability. The survey is constructed in such a way that learning effects are more immediate during data gathering.

MOTIFS aims to be a communicative monitoring tool, this holds a certain contradiction that is mirrored in the set of indicators. The developers needed to create indicators which are used for monitoring, hence the indicators need to measure in a highly precise manner. In adition the indicators need to be communicative, which means that they have to be understandable and transparent. For certain indicators, such as the social issues, this is an impossible task as the complexity cannot be monitored correctly with easily understandable and transparent calculations. As a result, , not all indicators can comply with the high quality standards for monitoring, contrary to what the end-user is expecting. On the other hand the developers of the OCIS PG-tool focussed on the learning aspect for the farmer rather than on the monitoring aspect, which creates indicators of a more uniform quality level, fulfilling what the end-user expects. They are transparent and communicative but hand in on monitoring capabilities. For example, many indicators are determined through a questionnaire with management options. As a result, a change in management will cause a change in the scores, but will not always have an clear effect on the sustainability of the farm. Our suggestion is to choose the goal clearly and either focus on monitoring or learning as both are hard to combine using one tool.

6. Conclusions

However, from the differences identified above, we can conclude that a complementary use of both types of tools seems feasible. As quick scan is suitable for a larger group of farmers, and as it is more directed towards learning, it can act as a trigger for farmers to take a first interest in sustainably farming. In a second stage, farmers that have taken an interest in the subject (or certain specific aspects) can focus on monitoring by use of an expert-based tool. These farmers will have to be more motivated, as they will need to spend more time and money during the process. They can maintain the learning aspect by discussing and comparing their individual results in small farmers' discussion group.

Furthermore, we observed during different implementations of both tools that the end-user has the inclination to adjust or select indicators depending on the goal of the project or the characteristics of participating farmers (sector, available data, etc.). Therefore, we suggest that in future research on ISA-tools modularity is important and indicators should be easily adaptable to local farming conditions. Ideally, it should be possible that indicators are determined bottom-up, not top-down. However, a clear methodology has to be used in order to ascertain the system representation (taking into account parsimony and sufficiency).

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