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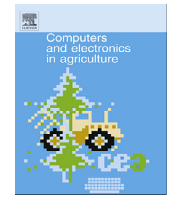

Decision support for prioritising of land to be preserved for agriculture: Can participatory tool development help?

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ABSTRACT

When rural planning complexity increases, such as in rural areas with a high urbanisation pressure, decision support tools can assist in determining which agricultural land should be given priority for preservation. Theoretically, traditional land valuation methods can cope with the multiple criteria at stake, but literature reveals a gap between the analytical potential of these methods and their actual use by the various stakeholders. This paper describes the participatory development and use of a new planning decision support tool called Agricultural Land Information System (ALIS) built to support prioritisation of land to be preserved for agriculture. Exploratory research reveals how the intended end users' participation in ALIS's development helped to prevent the implementation gap. The process directly and indirectly contributed to the fulfilment of success factors for tool implementation and to the initiation of a multi-tiered learning process. As such, ALIS does not represent a technical breakthrough, but its innovation lies in the participatory development and use. Examples given in this paper, e.g. on match–mismatch analysis, show how the participatory process leads to the inclusion of features that can widen the scope of land valuation methods and enable the user to think more deeply, more creatively and in a context-specific manner.

1. Introduction

Farmland in many countries is being converted to other land use types, with a resulting decrease in farmland area (Kerselaers et al., 2011). This has for example been described in the US (Thompson and Prokopy, 2009), China (Lichtenberg and Ding, 2008; Tan et al., 2009), Australia (Hulme et al., 2002) and various European countries (Calus et al., 2008). The main processes leading to the decrease in farmland area are urbanisation, urban sprawl and industrialisation (Hulme et al., 2002; Lichtenberg and Ding, 2008; Thompson and Prokopy, 2009; Tan et al., 2009). Pressure on farmland also stems from changing societal expectations for the countryside. The increased awareness of the need to protect vital ecosystems and natural processes, higher incomes, increasing leisure time, and increased mobility all lead to the conversion of farmland to other open space functions such as nature, woods, recreational areas, excess-water retention areas and others (Oltmer, 2003; Koomen et al., 2008; Kerselaers et al., 2013). These trends are part of an important transformation process in rural areas. The various functional claims on the open space lead to confrontations between a growing number of stakeholders with differing interests. This represents a challenge for spatial planning, of which the goal is to allocate all activities to the most suitable places while balancing various interests. Decision support systems can be helpful tools to help policy makers, planners and local stakeholders during these planning processes (Joerin et al., 2001; Santé-Riveira et al., 2008). This paper concentrates on one important aspect of spatial planning decisions, namely how to set priorities for farmland preservation from the agricultural point of view. The research is performed in Flanders, the northern region of Belgium, which is characterised by a high pressure on farmland for conversion to other types of land use.

Several land classification systems have been developed to support farmland preservation decisions (Wright et al., 1983; Hulme et al., 2002; Macaulay, 2002; Defra, 2003; Hoobler et al., 2003; FAO, 2007; Akinci et al., 2013). In Flanders, the Land Value Assessment tool (LVA) was developed by the Flemish Land Agency (*Vlaamse Landmaatschappij or VLM*, a governmental institute) (Kerselaers et al., 2011). All of these systems share the same principal idea: to allocate activities to the most suitable places. When conversion of farmland to a different land use type is unavoidable,

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it is preferable not to convert good quality farmland. The suitability of land for agricultural use should therefore be assessed when deciding which farmland will be converted to another land use. Land suitability analysis is also applied for other land use types, such as nature conservation or restoration (Hyman and Leibowitz, 2000; Geneletti, 2004; Nekhay et al., 2009), afforestation (Gilliams et al., 2005; Store, 2009), site selection for agricultural product warehouses (García et al., 2014), urban expansion (Dujmovic et al., 2008) or housing (Joerin et al., 2001).

Despite the wealth of available decision support tools, literature reveals that many of the tools developed are never applied in practice. Causes for this implementation gap are incompatibility with the intended decision tasks, too much focus on strict rationality and either too generic or too complex approaches (e.g. Lynch and Gregor, 2004; Vonk et al., 2005; Te Brömmelstroet and Schrijnen, 2010; Voinov and Bousquet, 2010; Van Meensel et al., 2012; Rossi et al., 2014). The tool users' inability to manage the tool's maintenance is recognised as a barrier for continued tool use (Voinov and Bousquet, 2010; Van Meensel et al., 2012). One of the pitfalls specific to spatial decision support systems is that people tend to rely too much on maps. But maps inevitably contain mistakes and uncertainties and cannot grasp the entire complexity of society's interests (Sieber, 2006). Similar to models, maps contain choices and should therefore not be interpreted as a purely objective source of information (Messner et al., 2006; Alkan Olsson and Andersson, 2007). Furthermore, maps risk to reduce discussions to the division of space and who gets how much of the pie (Wolsink, 2003; Barnaud et al., 2013; Van Herzele and van Woerkum, 2011). Finally, existing land evaluation systems are often inflexible and are not designed to take evolving knowledge, societal needs or data availability into account (Kerselaers et al., 2011; De Meyer et al., 2013). To ensure that the decision support tools actually get implemented in practice, it is considered valuable to involve the intended end users in the tool development process (Wang et al., 2008; Arnette et al., 2010; Gaddis et al., 2010; Jakku and Thorburn, 2010; Te Brömmelstroet and Schrijnen, 2010; Van Meensel et al., 2012).

This paper has two goals. One is to investigate the value of a participatory tool development process in preventing the above-described implementation gap. The second objective is to present a tool that has been developed through a participatory tool development process. That tool, called the Agricultural Land Information System (ALIS), has been developed to support planning processes where the agricultural sector is confronted with plans for converting farmland to other types of land use.

This paper is organised as follows: after this introduction, we describe the participatory process used during ALIS's development (Section 2). Then, the results are described and discussed in two parts, related to the two research objectives that have been defined. In the first part, the result of the tool development process, ALIS, is described (Section 3) and we present the ways ALIS can be used (Section 4). To make the tool description and the possible tool uses more tangible, we illustrate them for one case study area. Section 5 discusses the added value of ALIS by offering an overview of how ALIS deals with the risk of an implementation gap and describing ALIS's limitations. The second part of the paper focusses on the added value of the tool development process. We start with examples of ALIS's incremental adaptation during the participatory process (Section 6.1). Then, we link these adaptations to the earlier defined success factors for ALIS's implementation (Section 6.2). In Section 6.3, we discuss additional advantages and disadvantages of the participatory tool development, others than the ones related to the successful implementation. The final section summarises the most important conclusions of our research and identifies some challenges for further research.

2. Methodology: participatory tool development

This section describes the stages of the ALIS tool development process. Each stage in the process is characterised by a close and iterative interaction between the researchers who developed the tool and the decision makers intended to use the tool (Fig. 1). In these "interaction loops", the analyses from the researchers and the input from the decision maker are combined to strengthen each other. Each interaction loop also offers information for the subsequent loops.

Many tool development processes focus on innovating through the techniques used or new software. When developing ALIS, we instead focused on the participatory approach used to develop the tool and on gaining insight into its applicability in planning processes.

2.1. STAGE 1: Formulation of the need for a tool

The first step in tool development is to formulate the need for a tool (TN1). This seemingly self-evident step is mentioned explicitly because the future users themselves formulated the need for a tool. This first step in the participatory process is seen as indispensable. The need for ALIS originated from the abovementioned pressure on farmland. Despite the increasing use of the existing tool (LVA) in planning processes, the soundness of LVA was questioned and the users identified and formulated the need for an improved tool. The agricultural policy makers contacted us to help improve the scientific soundness of LVA.

Because the LVA tool already exists, the research started (A1) by describing LVA and analysing its shortcomings (Kerselaers et al., 2011; Kerselaers, 2012). The major problem identified was the inconsistency in LVA's consecutive applications for support of planning processes. In particular, the attributes and the weights of those attributes differed among applications without a valid justification for the difference. Other shortcomings were the lack of structure in the list of attributes; the discussion on the value functions is mixed with the discussion on the weights; and it is not clear whether the assumptions for weighted summation are fulfilled. As a consequence, LVA was incomprehensible for many people. When constructing the general framework for ALIS, we aimed to overcome these shortcomings.

2.2. STAGE 2: General framework

The actual tool development started by constructing a general framework. This general framework consisted of carefully chosen MCDA techniques appropriate to each step of the analysis, i.e. how to determine the evaluation criteria, the value functions and the weights, and how to integrate the partial assessments. The choices are based on guidelines from literature as well as consultation with a small group of decision makers (CM2). During these consultation moments, the participants were asked to test a number of techniques that were selected by the researchers. The advantages and disadvantages of these techniques were extensively discussed, options were compared and techniques were chosen collectively.

2.3. STAGE 3: Specified framework

After constructing the general framework, those techniques were applied to and specified for Flanders. This step resulted in concrete attributes, value functions and weights that can be used as a starting point for planning processes in Flanders. To assure that future tool users would approve the framework, an extensive group of users participated in this phase through focus group