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Optimal Design of Agricultural Sustainability Standards: Insights from a Delphi Study in Germany

Veronika Hannus

Chair of Agricultural Production and Resource Economics, Alte Akademie 14, 85354 Freising, Germany
Department of Agricultural Economics, Technical University of Munich
veronika.hannus@tum.de

ABSTRACT

Although there is persistent public attention on sustainability and there are growing markets for sustainable food, broad distribution of agricultural sustainability standards in Germany is missing. There are first sector specific studies regarding the motivation to use this management innovation. Specific research on benefits for farmers and on organizational issues concerning standard design is scarce. The Delphi method was used to identify the major reasons for standard adoption or rejection and to get insights to potential standard users' perception of sustainability. In the second Delphi round with 16 participants the importance and optimal configuration of 13 standard design elements, such as compliance assessment, technical support, used data basis for sustainability assessment or consulting intensity, was analysed. Linking the gained insights to Rogers' *Model of Five Stages in the Innovation-Decision Process* (Rogers, 2003) missing demonstration of the relative advantage, major deficiencies in standards' compatibility, together with high complexity as well as lacking trialability and observability are identified as main factors impeding further dissemination of sustainability standards as an innovation in farm management.

Keywords: *sustainability standards; delphi method; innovation adaption; management systems; decision;*

1 Introduction

In order to achieve the long-term reduction targets for greenhouse gas emissions from agriculture, German government continuously targets fertilizer management improvement and the expansion of organic farming (BMUB, 2014, p. 46). However, the agricultural sector has not reduced its emissions within the last few years (BMUB, 2014). In the same period growing markets for sustainable food can be observed and are demonstrated by sales growth, for instance, organic food sales in Germany rose in 2014 by 4.8% to € 7.91 billion (BÖLW, 2015, p. 15) and sales of fair-trade products increased from 2014 to 2015 by 11% (Blendin et al., 2016). This development leads to an increasing number of standards addressing sustainability in the food sector. There are company standards mainly in the dairy sector (e.g. DMK, 2016; Royal Friesland Campina, 2017) already in existence, as well as standards for the whole dairy value chain like the Irish Origin Green (Bord Bia, 2013 and 2014). In addition, the number of systems considering only some aspects of sustainability, such as animal protection, is rising (e.g. Initiative Tierwohl, 2016). This can be explained by the fact that comprehensive and in-depth sustainability assessment regarding the whole production system of a farm is very complex and therefore problematic. Thus in the last years science and practice have focused intensively on sustainability assessment, especially measurement and evaluation of environmental impacts of farming (see Bockstaller et al., 2009, p. 169; Christen and O'Halloran-Wietholtz, 2002 and Schader et al., 2012). The only publication comparing standards relevant in Germany, which address all three pillars of sustainability, from an economic point of view was presented by Doluschitz et al. in 2009. Since that time there was little further development in nation-wide agricultural sustainability standards and a broad dissemination in Germany of this innovation is missing. Against this background, the present study provides answers to the following research questions: Why are the existing comprehensive farm sustainability standards not implemented by a larger

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number of farmers in Germany? and What factors in sustainability standard design might influence the adoption of these programs?

From preliminary research by Hannus and Sauer (2017) in preparation for this study, the assumption was made that organizational system elements, expected to have a significant impact on farmers' standards' acceptance, can be identified and that the impact of different standard design can theoretically be explained by the *Model of Five Stages in the Innovation-Decision Process* (Rogers, 2003).

2 Theoretical background

Decision problems regarding the German quality system QS were studied by Jahn and Spiller (2005) using Davis' Technology Adoption Model (TAM) (ibid. 1985). Schulze et al. (2007) used the TAM to get insights on organic certification in agriculture. A first sector specific study regarding the motivation to participate in sustainability standards provided Luhmann et al. (2016). She included intrinsic and extrinsic factors to specify *Users' Motivation* to the TAM. The TAM model revert to the *Theory of Reasoned Action* (Fishbein and Ajzen, 1975) and the *Theory of Planned Behaviour (Ajzen, 1991)*. This approach is also used by other studies on decision-making behaviour of farmers, e.g. Garforth (2010), Aubert et al. (2012) and Gocsik et al. (2014) always focussing on motivation, attitude and intention.

In contrast, the present study uses the *Model of Five Stages in the Innovation-Decision Process* of Rogers (2003) for the first identification of factors hindering broader distribution of sustainability standards, depicted in figure 1.

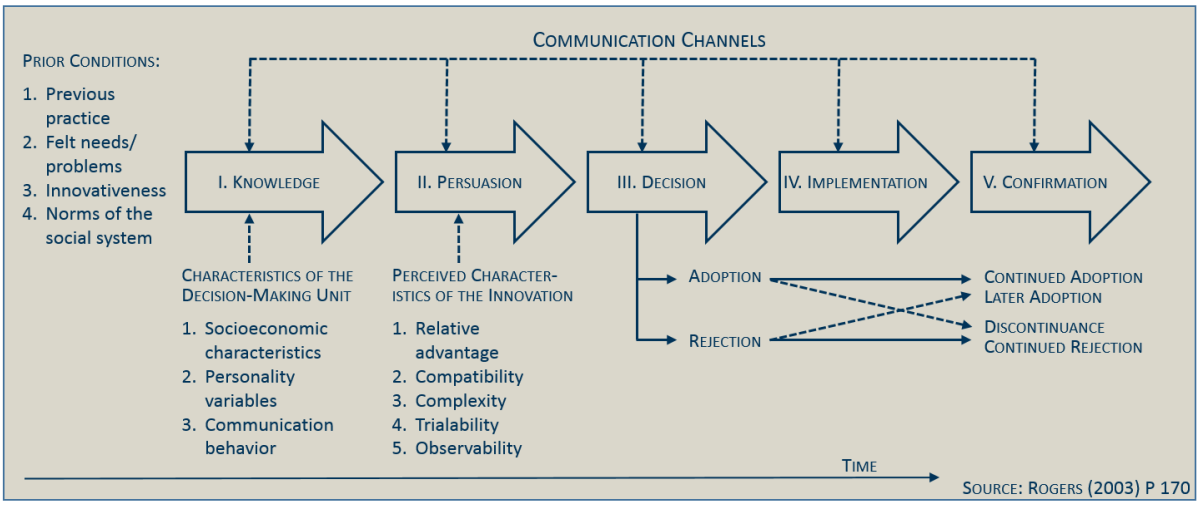

Figure 1: Model of Five Stages in the Innovation-Decision Process

This approach, first published in 1962, is more general and was chosen because ROGERS' theory, conceptualises "a broad framework that encompasses all the factors that could influence individual adoption and thereby the rate at which an innovation diffuses through a social system" (Vishwanath and Barnett, 2011, p. 10). This model is also used by Morris et al. (2000) in a study on the promotion of agri-environmental programs in agriculture. According to Rogers the innovation-decision process, consists of five stages: *Knowledge*, to become informed about and understand an innovation; *Persuasion*, to get "a favourable or an unfavourable attitude towards the innovation" (Rogers, 2003, p. 169); D*ecision*, for adoption or rejection of the innovation; *Implementation* and *Confirmation*, of the previous decision.

3 Delphi method

The Delphi method was used to identify the major reasons of standard adoption or rejection and to get insights to the preferences of potential standard users. Delphi is a systematic, multi-round survey aiming to identify and qualify experts' opinions regarding new issues. This is reached by feedback of each survey round given to participants before starting the next round. Comprehensive descriptions and selected examples of Delphi studies can be found in Häder (2014) and Turoff and Linstone (2002). Following Häder, who differentiates four types of the Delphi survey, the conducted study type was designed to raise and qualify the opinion of a specifically defined expert group.

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3.1. Study design

A combined sample of 40 non-organized German farmers and DLG farmers (Deutsche Landwirtschafts-Gesellschaft) as experts was invited to participate. With the choice of taking farmers as experts for the evaluation and assessment of design criteria, the capture of an internal view of the decision making process was intended. Other applied selection criteria for the experts were: profound interest for the topic "sustainability" or organic production or innovativeness in combination with willingness to invest time for the study. In addition, we tried to include a variation of age and gender, different farm sizes, production types and regions. In the first Delphi round 26 farmers participated from September to November 2016; the second, ongoing round had a total number of 16 participants by 24th January 2017.

The online-questionnaire included questions regarding:

- previous practice, felt needs, subjective and perceived social norms
- identification of reasons fostering and impeding the adoption of a sustainability standard
- experts' assessment of and preferences for design elements described in the literature.

3.2. Study sample

The sample of 26 experts covered farmers from all over Germany. In the first survey round, farmers with different production systems e.g. porker and pig production, vegetable production, horse husbandry and farm sizes from one to 2,500 ha participated. At the farms manpower from lower than one to 120 permanent employees is available. Of the farms, 65% participated in agri-environmental schemes with varying amounts of land under obligation. Four of the 26 farmers included in the study practice organic farming, three farms have the DLG Sustainability Certificate implemented.

The experts stated expertise mainly in: agricultural production and economics, conservation and personnel management. Eighty percent of the farmers have more than ten years of work experience in their main sector of expertise. All age groups were represented, but sample average age was younger than the federal average. Of the sample, 87% of the farmers live with partners, 86% with children under 16 at their farms. A very high educational level within the sample is explained by experts' selection regarding qualification.

4 Results

The first part of the survey asked for assessment of statements regarding sustainability in general, the perception of agriculture in society and sustainability of the own experts' farms. The following contributes to ***Prior Conditions*** (c.f. Rogers' model) were identified:

1. *Previous Practice:* The experts state that the sustainability of their own farms could be improved mostly in the economic and environmental dimension of sustainability.
2. *Felt needs/problems:* The expert farmers perceive a need for more sustainability in German agriculture in all three dimensions.
3. *Innovativeness:* 73% of the survey participants are innovative expert farmers and/or well informed DLG members.
4. *Norms of social system:* 95% state that sustainability is an important issue for the future and perceive agricultural sustainability as important for the public perception of agriculture.

The second part of the survey addressed aspects fostering and impeding the adoption of a sustainability system. The results provided information on the ***Perceived Characteristics of the Innovation*** (c.f. Rogers' model). In the first round of the Delphi process experts were asked in an open question to state three major reasons pro and three major aspects contra the use of such a standard. After rethinking the collected reasons, the experts were asked in the second survey to rank them, see figure 2. *The optimization of business processes* as well as *economic improvement* were ranked as the most important advantages. In addition, the *improvement of social acceptance and/or image*, as well as *sustainability and a better future-orientation* seem to be a purpose of great importance. *Resource protection and ecology* and, *sales improvement* represent

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further important reasons for the use of a sustainability system. *Improved product quality* is for many experts a less important reason but is still seen as superior to the *position with landlords and employees* for the use of such a system. These aspects represent the *Relative Advantages* (1.) being part of the ***Perceived Characteristics of the Innovation*** (of sustainability standards) in Rogers' model.

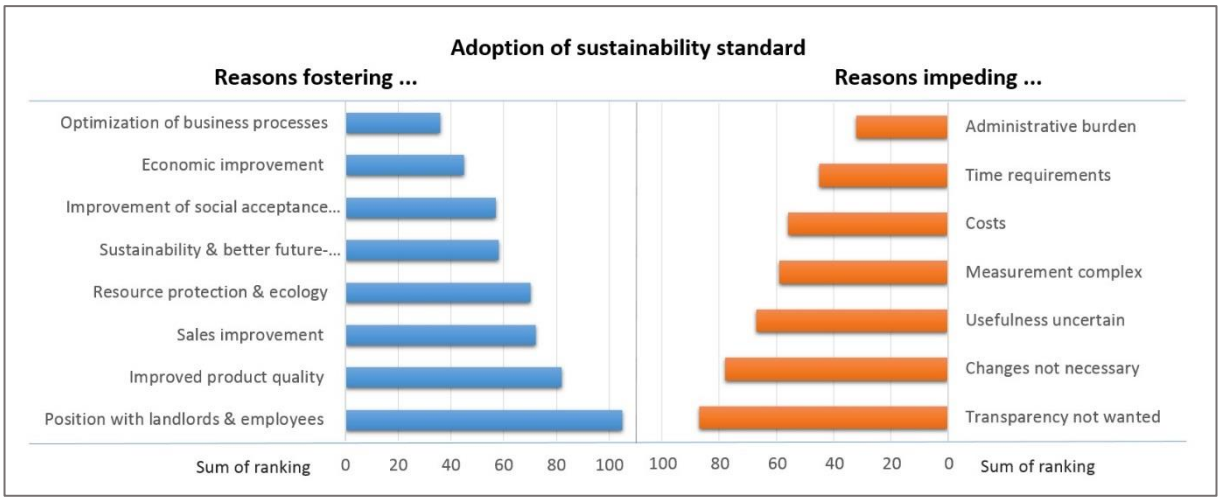

Figure 2: Assessment of the importance of design elements for acceptance of a standard

On the other hand, experts state high expected *costs*, *time requirements* and *administrative burden* as major aspects impeding a standard. While time requirements can refer to both time for the standards implementation and effort in the production processes, the administrative burden is more precisely specified. This can be a due to negative attitude towards office work itself, as well as a negative attitude against temporal binding of additional labour for "bureaucratic work". These three aspects address high effort for adopters caused by very low expected *Compatibility* (2.) (c.f. figure 1) of the innovation. According to the experts the *measurement* (of sustainability) is *complex* and dubious. The reason given for impeding the adoption of a sustainability standard demonstrates the high perceived *Complexity* (3.) (c.f. figure 1) of the existing systems. The *usefulness* connected with a standard is considered to be *uncertain*. That reflects low trust in the *Relative Advantages*. The aspects *changes not considered as necessary* and *transparency not wanted* mentioned in the first round, are of lower interest in the second round.

In the third part of the survey the experts had to assess the importance of 13 standard design elements for the acceptance of a standard by farmers. This elements have been studied from the ITC (International Trade Centre) standards database "Standards Maps" and literature on farmers decision making as well as studies regarding the adoption of agri-environmental schemes (cf. Hannus and Sauer, 2017). Using a 11-point Likert scale, with 10 = very important and 0 = not important, the expert farmers had to assess the importance of each design element and choose a preferred design in the first survey. In the second round, they were asked to reassess their valuation taking into account the appraisal and argumentation of the other experts, they got as feedback of the first survey. The comparison of the assessment of the two rounds, boxplots illustrated in figure 3, demonstrates the development of a common understanding and more uniform group opinion, as suggested for the Delphi method. Therefore the results are more reliable compared to other qualitative approaches.

Higher product prices, the data base used for sustainability assessment and the technical support, e.g. offering interfaces for digital data transfer of existing IACS-data (Integrated Administration and Control System), are assessed to be the design elements having most influence on the farmers decision. The geographical coverage of a standard is also a very important issue. Experts preferred a regional or national label. With respect to the offered consulting and support, two groups of farmers could be identified. Both stated an high expected impact of this design element on acceptance for a standard but they have different preferences for the consulting intensity.

The possibility to include innovations, the possible involvement in standard setting and the compliance assessment play a medium role for standards' design. Regarding the assessment of compliance, the experts preferred a ranking system, e.g. with stars like the German animal welfare label "Für mehr Tierschutz". Other

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offered design elements aiming to optimize the expected acceptance of a sustainability standard, such as labelling with an extended well-known label, cooperation for sales, the timeframe for public communication of participation or individual objectives, are assessed to be of lower importance. The level for threshold values for sustainability measurement is rated as the least important aspect.

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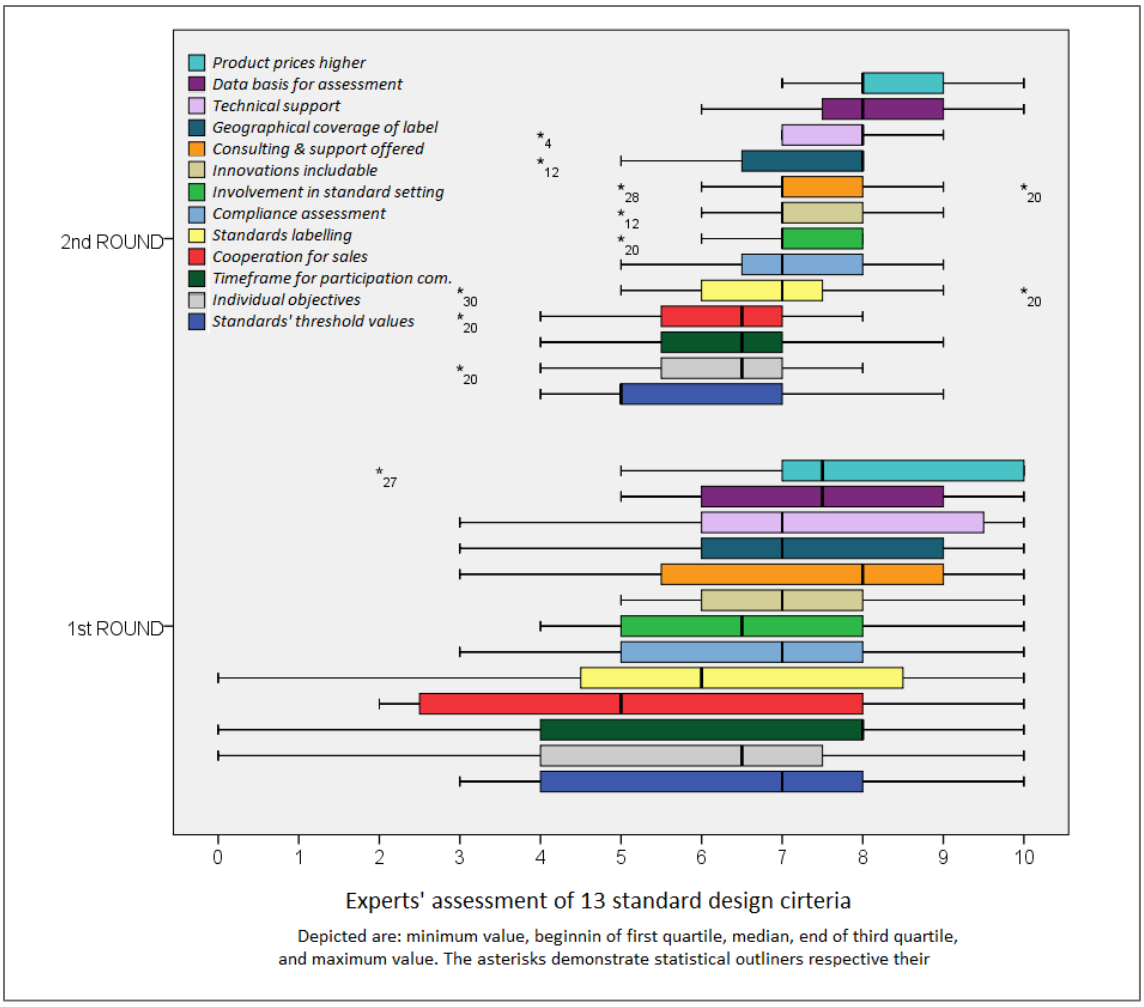

Figure 3: Assessment of the importance of design elements for acceptance of a standard

5 Discussion and conclusions

The analysis of ***Prior Conditions*** demonstrated a perceived need for the innovation: sustainability standard. Although the ***Characteristics of the Decision-Making Unit*** with well informed, high educated professionals leads to the expectation of a favourable setting for the adoption of a management innovation, deficiencies in the ***Perceived Characteristics of the Innovation*** were identified. In the main, sustainability standards miss a clear and visible *Relative Advantage*. Even though advantages are expected in process optimisation and cost reduction by using a standard, these do not seem to be convincing enough. Uncertain costs, time requirements and administrative burden reduce standards' perceived *Compatibility.* In general, the problem of uncertain effort and outcome are typical for management systems and described in quality and environmental management literature (Burritt and Schaltegger, 2010). For this reason, necessary effort for implementation and related costs need to be specified and investigated in greater detail.

Furthermore, most existing comprehensive sustainability standards are very *complex*. This is addressed by the stated issues: *complex measurement* and *uncertain usefulness*. This problem could be overcome with a more modular and activity-related standard. Such a standard could have medium basic sustainability requirements, for example regarding use of fertilizer and stocking rates, in combination with individual target areas (cf. Bord Bia, 2014). By selecting action areas, for instance, energy, emissions, waste, water or biodiversity with individual improvement targets, the farmers can benefit from existing environmental friendly practices or the participation in agri-environmental schemes just as animal welfare programs or regional marketing. In addition, sustainability standards have no *trialability* because of the long application period of at least six months and achieve only poor *observability*. The promotion of organic farming in the 2000s was an example of a strategic program to overcome similar obstacles. A network of demonstration farms was set up to showcase successful organic farming.

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Further research is needed: to focus relative advantages, to test the findings empirically with a large sample size and to include the analysis of the role of communication and networks.

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