Adoption of the agri-environmental measures: The role of motivations and perceived effectiveness

Abstract

This paper investigated farmers' self-stated adoption motives and the perceived effectiveness of agri-environmental measures in Finland. The measures were classified into ten distinct categories according to their prescriptions. The adoption motives were related to contextual factors, production factors and perceived effectiveness of the measures, while effectiveness was further related to land use, input use and the final impacts. The results indicate that the adoption motivations and the perceived effectiveness of the measures are related to their prescriptions: measures targeting the same problem with different prescriptions fit the aims and farming strategies of different farmers.

Keywords:

Agri-environmental measures, adoption, farmer perceptions, fitness, effectiveness

1 Introduction

The intensification and restructuring of agricultural production throughout the world has contributed to several environmental problems: water eutrophication, soil degradation, pesticide contamination, air quality problems, climate change effects and biodiversity losses (OECD 2008). Farmers' choices regarding the farming practices have a crucial role for the development of the environmental effects of agriculture. Within the European Union, these practices are promoted as part of nationally implemented agri-environmental schemes (AES) that include financial incentives to compensate the additional costs and economic losses caused by their adoption (European Commission 2005). Understanding decision-making concerning participation in these schemes is a focal foundation for eliciting behavioural change. The decision-making of individuals is based on personal beliefs, perceptions and constructions of the reality, which are combined with the goals, values and attitudes of the decision-maker (Baron 2008). All of these constructs are formed in interaction with the external environment, which also constrains individuals' choice sets (Burton 2004). The internal environment may also set such constraints in the form of, for example, capability deficiencies (Burton 2004). Farmers' decision-making is typically motivated by some fundamental premises, such as seeking viability and ensuring continuity over generations (Ingram et al. 2013, Sutherland 2010, Vanclay 2004).

Researchers have long sought to understand the structural and behavioural antecedents related to adoption of agri-environmental practices. The meta-analytical reviews have revealed that few factors explain adoption decisions universally (Knowler and Bradshaw 2007). Based on research conducted so far, the adoption decisions may be seen to be contingent upon several factors, all of which are not within the sphere of farmers' decision-making – decision-making is highly contextual (Siebert et al. 2006, Wilson and Hart 2000). Positive attitudes towards environment and pro-environmental practices typically precede adoption, but the relationships between attitudes, contexts and behaviours are complex (Ahnström et al. 2008). Farmers are actors within wider systems and networks, and the system properties may limit the choice possibilities of farmers significantly (Carlisle 2016). Adequate resources in the form of knowledge and information and also financial resources enhance adoption (Grammatikopoulou et al. 2016, Pavlis et al. 2016, Wilson and Hart 2000). Support from social networks and the conception of environmentally-friendly practices as culturally accepted farming practices similarly enhance their adoption (Huttunen and Oosterveer

2016, Burton et al. 2008). Findings concerning structural factors such as age of the farmer, farm size and dependency on farming as a source of livelihood are mixed and sometimes contradictory (Lastra-Bravo et al. 2015). The antecedents of adoption are contingent upon the characteristics of the subject of choice – different factors precede the choice of different practices (Pannell et al. 2006, Van Herzele et al. 2013). Generally, adoption is more likely to occur, when the farming system fits well with the prescriptions of the scheme and the specific measures (Lobley and Potter 1998, Zimmermann & Britz 2016), and when the adoption is considered to enhance the adopters' goals (Pannell et al. 2006).

The aim of this study is to increase understanding of farmers' adoption behaviour of agri-environmental practices in the context of agri-environmental schemes within the European Union. For that end, this study surveys the adoption motivations of Finnish farmers with a representative dataset covering 20 distinct agri-environmental measures (AEM), treated in bundles based on the practice characteristics. In addition, farmers' perceptions of the environmental effectiveness of these measures are also described. The study makes three contributions: first, it brings forth farmers' self-stated motivations related to adoption. Farmers' choices are fuelled by the very diverse motivations and constrained by the resources and the external environment, which suggests that motivations should be observed explicitly. Second, the study takes into account the practice characteristics. Concomitantly, it becomes possible to observe relationships with the specific practices and farmers' self-stated motivations. Farmers' self-stated adoption motivations have been previously explored on a scheme level (e.g. Morris and Potter 1995, Pavlis et al. 2016, Wilson and Hart 2000) or for targeted practices, such as fertilization or nutrient management practices (Macgregor and Warren 2006, Söderqvist 2003). Accounts of farmers' self-stated motivations concerning all the measures within an AES have been rarely conducted, with the notable exception of Van Herzele et al. (2013), who studied the adoption motivations of simple, medium and complex agri-environmental measures. The approach chosen here resembles that of Van Herzele et al.'s, but the practices are defined by their environmental effectiveness potential instead of implementation complexity. Third, the study links the farmers' perceptions of the environmental effectiveness of the agri-environmental scheme with the adoption of specific practices. Decision-making is not a linear process with a beginning and an end, but rather, it is an evolving cycle with feedback loops informing the decision-maker about the consequences of previous choices (Meyfroidt 2012, Pannell et al. 2006, Schlüter et al. 2017). Thus, the observed or perceived effectiveness of the measures is likely to affect future choices (Reimer et al. 2012, Villanueva et al. 20150).

The research falls within the behavioural tradition of research on farmer decision-making regarding adoption of agri-environmental practices. It explores the factors that farmers themselves perceive to condition the adoption of agri-environmental practices. Through this extensive contextual understanding of the decision-making heterogeneity it is possible to inform policy makers, administrators, advisers and researchers about feasible ways to design and target agri-environmental measures. The paper is organized as follows: chapter 2 presents the materials and methods used, chapter 3 presents the results, and chapter 4 concludes with a discussion.

2 Materials and methods

This research is based on data collected in the mid-term evaluation of the Rural Development Programme for Mainland Finland 2007-2013 in 2010 (Kuhmonen et al. 2010). The programme addresses a wide range of economic and environmental issues of the farms and rural areas. The Finnish agri-environmental scheme is conducted as a part of this rural development programme (MAF 2014). A survey request was sent to all farmers having an email address in the farm register (IACS), altogether about 23,000 farmers. The data consists of 2,124 farmer responses, resulting in a response rate of 9.2 %. The amount of farms in Finland is approximately 60,000, meaning that roughly one third of the farmers had stored their email addresses in the system. In terms of representativeness, slight biases were present towards overrepresentation of large farms, young farmers and farms with other livestock and crops than the most conventional ones (table 1). Despite these biases, the data can be considered as a valid sample of the Finnish farm population. The survey covered all types of farm production and the whole mainland area. The topics addressed by the survey and analysed in this paper included the adoption of the agri-environmental measures, self-stated motives for the adoption of the measures and the perceived effectiveness of the agri-environmental scheme.

Table 1. Representativeness of the data.

Line of production	Survey farms %	All farms %	Farm size	Survey farms %	All farms %	Age	Survey farms %	All farms %
Dairy	18 %	18 %	- 14.99	19 %	32 %	- 29	4 %	3 %
Beef	6 %	6 %	15 – 29.99	22 %	26 %	30 – 49	54 %	42 %
Pig husbandry	5 %	3 %	30 – 49.99	23 %	19 %	50 -	42 %	55 %
Poultry	1 %	1 %	50 – 74.99	17 %	12 %	*Total*	*100 %*	*100 %*
Other animal husbandry	3 %	5 %	75 – 99.99	9 %	6 %			
Cereals	43 %	44 %	100 -	10 %	6 %			
Other special crops	6 %	6 %	*Total*	*100 %*	*100 %*			
Garden crops	5 %	3 %						
Other crops	8 %	13 %						
Other production	5 %	1 %						
Total	*100 %*	*100 %*						

The Finnish agri-environmental scheme in 2007-2013 was divided into two subsets: the basic-level scheme with basic and additional measures, and the special agri-environmental scheme with targeted measures. The additional measures may or have to be adopted by those who have opted into the basic-level scheme, depending on the location of the farm. The basic scheme includes 'broad brush' type of measures, whereas the special measures are more demanding and complex to implement, but also more effective in environmental terms, thus representing 'deep and narrow' type of agri-environmental measures. One farmer may opt into both the basic and special schemes, and he or she may also adopt several measures from the schemes. The adoption rate of the basic agri-environmental scheme was very high with 98% of the respondents having opted into the basic-level scheme. The rate in the sample is higher than among the base population, where 89% of farmers had opted in the basic-level scheme (MAF 2011). The adoption rate of the special measures within the dataset was 37%, while the adoption rate among the base population was 24% (MAF 2011).

The 20 measures offered within the scheme and inspected here (three additional measures for garden farms were excluded due to their specific targeting) were further categorized into nine distinct classes based on the measure prescriptions. The categories were labelled as follows. '*Optimizing fertilization*' includes two types of additional measures that aim at reducing the fertilization based on nutritional computations and analyses. The measures within the '*Reducing fertilization*' category promote extensification of the farming system. The category includes two additional measures and three special measures with fixed fertilization levels. The measures within the basic level and special level schemes were analysed separately. The category '*Tillage practices*' includes basic-level measures enhancing winter-time plant cover and reduced or no-tillage. '*Crop portfolio*' category includes two basic-level measures which promote diversification of the cropping system and cultivation of catch plants to reduce nutrient emissions. '*Manure management'* category includes one measure from the basic-level scheme and one from the special scheme which enhance manure spreading during the growing season and incorporation of liquid manure into the soil to reduce emissions caused from spreading the manure. '*Protecting the waterways*' includes three special measures aiming at decreasing nutrient flows to water bodies using riparian zones, wetlands and runoff water treatment methods. '*Nature management fields'* includes one measure from the basic scheme with the same name as the category, which enhance setting aside farmland. '*Promoting biodiversity*' includes three special measures related to farmland nature conservation and breeding of local breeds. '*Organic farming*' includes the special measure of organic production. The measures and the adoption rates of the measures and categories are presented in table 2.

Table 2. Classification of the agri-environmental measures and adoption rates of the specific measures and measure categories within the data (n of all respondents 1567). B refers to basic-level scheme, S refers to special scheme.

Category	**Measures**	**Adoption (measures, n, %)**	**Adoption (category, n, %)**
Optimizing fertilization (B)	Calibrated fertilization	374, 23.9%	685, 43.7%
	Nutrient balances	336, 21.4%	
Reducing fertilization (B)	Reduced fertilization	262, 16.7%	310, 19.8%
	Extensive grassland production	60, 3.8%	
Reducing fertilization (S)	Intensified reduction of nutrient loading	25, 1.6%	59, 3.8%
	Long-term grass cultivation of organic lands	19, 1.2%	
	Arable farming in groundwater areas	19, 1.2%	
Tillage practices (B)	Plant cover during winter and reduced tillage	1044, 66.6%	1044, 66.6%
Crop portfolio (B)	Crop diversification	205, 13.1%	221, 14.1%
	Cultivation of catch plants	31; 2.0%	
Manure management (B+S)	Spreading manure during the growing season (B)	144, 9.2%	222, 14.2%
	Incorporation of liquid manure into the soil (S)	88, 5.6%	
Protecting the waterways (S)	Runoff water treatment methods	22, 1.4%	230, 14.7%
	Riparian zones	209, 13.3%	
	Multifunctional wetlands	14, 0.9%	
Nature management fields (B)	Nature management fields	605, 38.6%	605, 38.6%
Promoting biodiversity (S)	Traditional rural biotopes	104, 6.6%	266, 17.0%
	Enhancing the biological and landscape diversity	165, 10.5%	
	Local breeds and crops	53, 3.4%	
Organic farming (S)	Organic production	168, 10.7%	168, 10.7%

In the survey, the respondents were asked to freely express motives for the adoption of additional measures and special measures. The respondents were also asked to identify the environmental effects of the agri-environmental scheme on their own farm. For the additional measures, 1,278 responses were given and 540 responses for the special measures. Further, out of the 1,827 farmers who chose additional measures, 70% stated their motives for the adoption. For the special measures, with 784 farmers in the sample having adopted them, 69% of these respondents stated their motives for the adoption. For the perceived effectiveness of the scheme, 1,169 responses were given, resulting in a response rate of 55% among all respondents.

The responses to all open-ended questions were analysed by means of *conventional content analysis*, in which the coding categories were derived from the data (Hsieh and Shannon 2005). Content analysis allows to qualitatively organise large amounts of text into a restricted number of categories (Weber 1990), which may then be analysed using quantitative methods. The self-stated motives for the adoption of additional and special measures were identified as referring either to contextual factors, production-related factors or effectiveness-related factors. The same response could be coded in multiple categories. First, *the contextual factors* identified were related to the farmer-specific factors (preferences, characteristics, attitudes), farm-specific factors (such as presence of suitable land for specific purposes) and the farmers' networks including other farmers and advisors. Second, *the production-related factors* were related to the fit of the measure with the agricultural production either generally or specifically (fit with the line of production, production methods, existing machinery and other infrastructure), easiness of the prescriptions, benefits related to the measure, cost-effectiveness, familiarity and feasibility. Third, the *effectiveness-related factors* referred to either environmental or economic effects. For the special measures, additional categories for the environmental effectiveness were used, when the respondent specified e.g. landscape, biodiversity or water quality as the most important environmental benefit delivered by the measure.

The perceived effectiveness of the agri-environmental scheme was coded into three categories according to the two different causal mechanisms and the final impact. The causal mechanisms identified by the respondents referred to *changes in land use patterns* and *changes in the productive practices*. The subcategories within the land use category were grass-cover, nature management fields, filter strips, riparian zones, avoiding abandonment of arable land and environmental management. Within the productive practices category, the subcategories were the use of pesticides, fertilizing practices, organic farming, and changes in the production system. *The final impact category* included erosion, air emissions, quality of the farm environment, soil quality, landscapes, biodiversity, ground waters, nutrient emissions to surface waters and environmental awareness. Additionally a class labelled "no significant effect" was identified.

The responses were analysed by contingency tables with the Chi square test for statistical significance. The analyses were conducted for those cases that had responded to the corresponding question, i.e. excluding cases with missing data. Thus, the analysis of the motives for adopting the basic-level scheme included 1,278 cases, analysis of the motives for adopting the special scheme included 540 cases and analysis of the scheme's effectiveness included 1,169 cases.

3 Results

The results of the analysis are presented in Tables 3–5. In these tables, the average frequencies of the adoption motives and perceived effectiveness of all the measures are given first. The frequencies are then presented separately for each measure category. The exact significance value (p) depicting either positive or negative association profiling the measure categories is given when the association is statistically significant ($p < 0.05$, in cases of small group sizes also p values < 0.1 are given in parentheses). In the following presentation of the results, the positive profilers as compared to negative profilers of the measure categories are of special interest.

The most common motives to adopt basic-level measures were production-related motives (88%), while effectiveness-related motives accounted for 13% of responses and contextual motives 3%. The single most frequently mentioned adoption motive was the general fitness of the measure with the production system of the farm, followed by the easiness of the measure (table 3). Consistently, Wynne-Jones (2013) noted that farmers welcomed such agri-environmental management practices that were considered primarily productive. For the more environmentally effective special measures, the adoption motives were somewhat different, with context factors accounting for 36%, production factors 51% and effectiveness factors 26% of the motives, respectively (table 4). Within the special measures, the single most common motive was the farm-related factors within the contextual factors followed by environmental effectiveness in total.

The *contextual factors* were mentioned as adoption motivations by 3% of basic scheme adopters and 36% of special scheme adopters. *Farm factors* were important adoption motivations for the special measures, especially waterway protection, promoting biodiversity and reducing fertilization, while they only played a minor role for the basic measures. This implies that especially special measures were adopted because of the existence of suitable areas, such as waterways and seminatural cultural habitats. Similar results have been presented by Murphy et al. (2011) concerning the presence of wetlands and adoption of water quality maintaining practices and by Home et al. (2014) and Van Herzele et al. (2013), among others, concerning the presence of farmland with lower productivity and the adoption of extensive agricultural practices. Those farmers who were motivated by *personal factors* in adoption decisions stated that the specific practice was important or it agreed with their worldview in general. Personal factors were seldom mentioned to motivate the adoption of the basic-level measures, but were particularly pronounced in adoption of organic farming and biodiversity promoting practices among the special measures. The effect of various personal factors, including environmental concern, attitudes and orientation has been widely explored in the adoption literature, with a general positive effect on adoption, although the impact is moderated by several context-specific factors. The management of traditional rural biotopes in Finland has been associated with farmers' personal goals (Birge and Herzon 2014), while meadow bird protection has been associated with farmers' self identity (van Dijk et al. 2015). In the adoption of organic farming, the environmental attitudes (Läpple and Kelley 2013) and orientations (Micha et al. 2015) play a role. *Social networks* mattered as adoption motives especially when the implementation of the practice required use of special machinery as in the case of practices related to manure management. These were in some cases available through subcontractors or neighbouring farmers. Also the influence of family and extension services counted within the category. Use of contractors has been linked to adoption decisions also by Grammatikopoulou et al. (2016) and Huttunen (2015), both in Finland.

Regarding the *production-related adoption motivations*, the *fitness* of the measure with the farming system in general, or more specifically with the line or method of production was mentioned altogether in 42% of the responses for the basic-level scheme and in 28% for the special scheme. In the adoption literature, compatibility or fitness with the existing system has often been cited among the most important factors affecting adoption (Lobley & Potter 1998, Van Herzele et al. 2013) – especially regarding adoption of simple practices such as the basic level practices (Wilson & Hart 2000). *Feasibility* was a similar fitness-related motivation mentioned by 13 % of the basic-level measure adopters and 3 % of the special scheme adopters. The difference compared to the other fitness motivations was, however, the perception that enrolment into the scheme was a necessity for income reasons, and the farmer chose the one compulsory additional measure he or she thought was possible to implement on the farm – thus the difference in frequencies of this motivation between the basic and special schemes. *Easiness* of the measure was the second most common motivator after general fitness with one fifth of respondents mentioning it for basic-level measures, while only 5 % indicated easiness as a motivating factor for special scheme measures. In the adoption literature, the perceived complexity and difficulty of the practices usually affect adoption negatively (Sattler and Nagel 2010, Wauters et al. 2010), while easiness has a positive effect (Defrancesco et al. 2008, Van Herzele et al. 2013).

Generally, the perceived *benefits* are important for adoption of agri-environmental measures (e.g. Villanueva et al. 2015). The benefits derived from the adopted measures were cited as motivating factors in 5 % of the responses concerning the basic-level measures and 2 % of the special measures. Perceived benefits profiled especially manure management within the special scheme; similar results concerning the benefits of manure management practices have been reported by Huttunen (2015) and McCann et al. (2015). *Familiarity* was a more important motivator within the special measures (9 % of respondents cited this motivation) than in basic measures (5 %). Previous experience of the practice typically enhances adoption, as indicated by e.g. Defrancesco et al. (2008) and Micha et al. (2015). In this case, familiarity also referred to cases in which a farmer would have implemented the practice even without financial incentives as he or she was accustomed with the measure; this was typically the case in biodiversity promoting measures. *Cost-effectiveness* refers to the cases in which a farmer perceives benefits related to cost savings arising from implementing the practice. Within the adoption literature, cost-effectiveness has often been cited as an important factor motivating adoption (e.g. Huttunen 2015, Macgregor and Warren 2006). It was mentioned as an adoption motivation in 6 % of responses concerning the basic-level measures and 5 % concerning the special measures, and it was related to especially reducing fertilization within the basic scheme and manure management within the special scheme. Existence of *suitable machinery* was related to especially manure management measures. This motivation reflects the need for specific infrastructure for the farmers to be able to apply the measures (Vanclay

2004), and has been found to affect adoption similarly by Huttunen and Oosterveer (2016) and Reimer et al. (2012).

Effectiveness-related factors were mentioned as adoption motivations in 13 % of the responses concerning the basic-level measures and in 26 % of responses concerning the special measures. Thus, the perceived effectiveness of the measures played a larger role for the special scheme, and especially the role of perceived positive environmental effects was more significant for the special scheme than for the basic scheme (19 % in the special scheme vs. 5 % in the basic scheme). However, the role of economic incentives as an adoption motivator was similar in both of the schemes (8 % in the basic scheme vs. 9 % in the special scheme). The role of economic motivations was highlighted in the case of crop portfolio practices and organic farming. Van Herzele et al. (2013) found that economic incentives matter especially for the measures with high complexity, a finding that applies to the results presented here as well.

Regarding the perceived *environmental effectiveness* of the agri-environmental scheme, almost half of the respondents (47 %) identified positive environmental impacts induced by the scheme (table 5). Changes in the productive practices were identified as the major impact by 38 % of the respondents and effects on land use by 24 % of the respondents. 10 % of the respondents identified no impacts. Most frequently cited effects were related to the surface waters and nutrient emissions (28 %), followed by fertilizing practices (27 %). Changes in the fertilization practices were identified especially by adopters of the measures related to optimizing fertilization, which suggests that even though these measures do not include detailed prescriptions about the amount of fertilization, they do affect farmers' behaviour. Many respondents identified the practice they had adopted as the positive environmental effect born as a result of implementing the scheme. Within the land use practices, plant and grass cover was mentioned as the positive environmental effect especially by adopters of measures related to tillage practices, nature management fields were mentioned by those farmers who had applied the measure, and riparian zones were mentioned by adopters of riparian zones. Infrequently mentioned but interesting effectiveness categories within the land use effects were related to avoiding abandonment of farmland and environmental management. Environmental management may be related to final impact categories of quality of the farm environment and landscape. They characterize the landscape, aesthetics and appearance issues related to adoption of agri-environmental measures, and profiled especially adoption of practices related to waterway protection, promoting biodiversity and organic farming. These issues may also impede adoption, as noted by Burton et al. (2008), but may also act as motivators (Home et al. 2014). Avoiding abandonment profiled the basic level practices of reducing fertilization, and suggests that these AEMs are important for those (likely part-time) farmers who are evaluating the pros and cons of keeping the fields cultivated. Adopters of the special measures did not differ from all respondents based on frequencies of land use effects, productive practices or environmental effects identified, although some differences in the subgroups were present that could be related to the nature of the measures, such as setting up riparian zones, practicing organic farming or protecting ground waters. Relatively few adopters of the special measures also perceived that the scheme had no environmental effects whatsoever. The perception of no environmental impacts induced by the scheme may be related to either the awareness and attitudes of the respondents or selectivity of the measures. The difference between the special scheme adopters and all adopters implies differences in awareness factors, but the slightly higher frequencies within reduced fertilization adopters imply that the effective changes induced by the practices may be limited among these respondents.

Table 3. Adoption motives for the categories of measures within the basic-level agri-environmental scheme. For each category, the frequencies (% of adopters) and p-values depicting statistically significant associations are given. n=1278.

	All categories	Optimizing fertilization		Reducing fertilization		Tillage practices		Crop portfolio		Manure management		Nature mngt. fields	
Share of adopters:		*48,0 %*		*21,1 %*		73,6 %		15,5 %		10,3 %		38,8 %	
Adoption motives:	***%***	***%***	***p***	***%***	***p***	***%***	***p***	***%***	***p***	***%***	***p***	***%***	***p***
Contextual factors													
Personal factors	0.8 %	1.0 %		1.1 %		0.9 %		1.5 %		0.8 %		1.2 %	
Farm factors	1.7 %	1.3 %		2.6 %		2.1 %	0.044	1.5 %		0.0 %		2.4 %	
Social networks	0.5 %	0.3 %		1.5 %	0.040	0.3 %		1.0 %		2.3 %	0.027	0.4 %	
All contextual factors	*3.1 %*	*2.6 %*		*5.2 %*	*0.022*	*3.3 %*		*4.0 %*		*3.1 %*		*4.0 %*	
Production-related factors													
General fitness	24.4 %	28.1 %	0.002	24.1 %		26.1 %	0.012	27.8 %		29.0 %		27.8 %	0.014
Line of production	6.7 %	4.6 %	0.003	8.5 %		7.0 %		3.5 %	0.003	8.4 %		5.2 %	
Method of production	10.8 %	9.6 %		7.8 %	0.042	12.4 %	0.001	18.7 %	0.000	9.2 %		11.7 %	
Feasibility	12.7 %	16.5 %	0.000	8.1 %	0.006	11.5 %	0.023	11.6 %		9.9 %		11.1 %	
Easiness	20.5 %	19.1 %		15.9 %	0.020	21.1 %		9.6 %	0.000	18.3 %		16.9 %	0.007
Benefits	5.2 %	6.2 %		4.8 %		3.4 %	0.000	1.0 %		5.3 %		4.6 %	
Familiarity	4.7 %	3.3 %	0.014	4.8 %		4.5 %		4.5 %		6.1 %		4.8 %	
Cost-effectiveness	5.9 %	6.2 %		11.1 %	0.000	5.9 %		6.1 %		4.6 %		6.3 %	
Suitable machinery	2.7 %	2.3 %		0.4 %	0.002	2.4 %		6.1 %		5.3 %	(0.059)	2.8 %	
All production-related factors	*8.8 %*	*88.3 %*		*81.1 %*	*0.000*	*88.3 %*		*84.3 %*		*90.1 %*		*86.7 %*	
Effectiveness-related factors													
Economic effects	8.1 %	11.1 %	0.000	8.9 %		9.0 %	0.029	18.7 %	0.000	9.9 %		11.5 %	0.000
Environmental effects	5.2 %	4.4 %		9.6 %	0.000	5.7 %		7.1 %		4.6 %		4.6 %	
All effectiveness-related factors	*12.9 %*	*14.7 %*	*0.042*	*18.5 %*	*0.002*	*14.4 %*	*0.005*	*24.7 %*	*0.000*	*13.7 %*		*15.7 %*	*0.011*

Table 4. Adoption motives for the categories of measures within the special agri-environmental scheme. For each category, the frequencies and p-values depicting statistically significant associations are given. n=540.

	All categories	Reducing fertilization		Manure management		Protecting the waterways		Promoting biodiversity		Organic farming	
Share of adopters:		9,6 %		14,6 %		35,4 %		44,4 %		27,8 %	
Adoption motives:	***%***	***%***	***p***	***%***	***p***	***%***	***p***	***%***	***p***	***%***	***p***
Contextual factors											
Personal factors	8.3 %	0.0 %	0.009	3.8 %		3.1 %	0.001	10.4 %		20.7 %	0.000
Farm factors	26.3 %	26.9 %		5.1 %	0.000	41.9 %	0.000	27.1 %		7.3 %	0.000
Social networks	2.4 %	0.0 %		11.4 %	0.000	1.6 %		0.8 %	0.028	0.0 %	0.014
All contextual factors	*36.1 %*	*26.9 %*		*19.0 %*	*0.000*	*45.5 %*	*0.001*	*37.1 %*		*26.7 %*	*0.000*
Production-related factors											
General fitness	16.5 %	21.2 %		22.8 %		17.3 %		20.4 %	0.019	20.0 %	
Line of production	4.1 %	1.9 %		1.3 %		0.5 %	0.001	6.7 %	0.006	4.7 %	
Method of production	7.6 %	5.8 %		3.8 %		1.0 %	*0.000*	7.9 %		18.7 %	0.000
Feasibility	3.0 %	5.8 %		6.3 %		2.6 %		1.7 %		1.3 %	
Easiness	5.0 %	7.7 %		2.5 %		5.2 %		6.3 %		2.0 %	0.032
Benefits	2.0 %	1.9 %		8.9 %	0.000	1.6 %		0.4 %	0.014	0.0 %	0.027
Familiarity	8.9 %	3.8 %		7.6 %		5.2 %	0.018	11.7 %	0.031	12.0 %	
Cost-effectiveness	5.0 %	7.7 %		13.9 %	0.001	4.2 %		2.5 %	0.013	6.0 %	
Suitable machinery	1.3 %	1.9 %		7.6 %	0.000	0.0 %	0.046	0.0 %	0.016	0.0 %	
All production-related factors	*50.9 %*	*57.7 %*		*70.9 %*	*0.000*	*37.2 %*	*0.000*	*54.2 %*		*62.0 %*	*0.001*
Effectiveness-related factors											
Economic effects	9.1 %	9.6 %		11.4 %		6.8 %		6.7 %		16.0 %	0.001
Environmental effects generally	7.6 %	17.3 %	0.011	8.9 %		8.9 %		6.3 %		14.0 %	0.001
Chemical loading	1.1 %	0.0 %		0.0 %		0.5 %		0.8 %		4.0 %	0.000
Landscape	4.8 %	5.8 %		0.0 %	0.015	3.1 %		10.4 %	0.000	2.7 %	
Biodiversity	1.5 %	3.8 %		0.0 %		2.1 %		2.1 %		2.7 %	
Waterways	5.4 %	3.8 %		2.5 %		14.1 %	0.000	2.5 %	0.006	1.3 %	0.005
Environmental effects, total	*19.3 %*	*26.9 %*		11.4 %	0.034	26.7 %	0.001	20.8 %		23.3 %	
All effectiveness-related factors	*25.7 %*	*30.8 %*		*17.7 %*	*0.049*	*31.4 %*	*0.017*	*25.0 %*		*34.7 %*	*0.003*

Table 5. The perceived effectiveness of the categories of agri-environmental measures. For each category, the frequencies and p-values depicting statistically significant associations are given. n=1169.

B=basic scheme, S=special scheme	**All**	**Special scheme**		**Optimizing fertilization (B)**		**Reducing fertilization (B)**		**Reducing fertilization (S)**		**Tillage practices (B)**	
Share of adopters:		39,3 %		45,5 %		19,1 %		4,0 %		66,5 %	
Perceived effectiveness:		**%**	***p***	**%**	***p***	**%**	***p***	**%**	***p***	**%**	***p***
Causal mechanism: land use											
Plant and grass cover	11.2 %	8.0 %	0.003	10.8 %		11.1 %		11.1 %		14.9 %	0.000
Nature management fields	4.0 %	2.9 %		4.1 %		5.1 %		2.2 %		4,5 %	
Filter strips	3.3 %	2.9 %		3.3 %		2.3 %		6.7 %		3.4 %	
Riparian zones	3.2 %	6.5 %	0.000	3.1 %		1.4 %		0.0 %		3.6 %	
Avoiding abandonment	1.7 %	1.6 %		0.6 %	0.007	3.7 %	0.017	0.0 %		1.8 %	
Environmental management	1.6 %	3.6 %	0.000	2.1 %		0.9 %		0.0 %		1.5 %	
Land use effects, total	*24.4 %*	*24.8 %*		*22.8 %*		*23.5 %*		*20.0 %*		*28.9 %*	*0.000*
Causal mechanism: productive practices											
Pesticide use	3.3 %	4.2 %		2.5 %		2.3 %		8.9 %	(0.059)	3.0 %	
Fertilizing practices	26.7 %	20.5 %	0.000	32.0 %	0.000	31.3 %		13.3 %	0.024	23.2 %	0.000
Organic farming	3.2 %	7.8 %	0.000	3.3 %		2.8 %		4.4 %		3.6 %	
Changing the production methods	6.4 %	6.9 %		6.8 %		3.2 %	0.019	4.4 %		7.0 %	
Productive practices effects, total	*37.6 %*	*37.1 %*		*42.7 %*	*0.001*	*38.7 %*		*28.9 %*		*34.3 %*	*0.001*
Final impact											
Erosion	5.1 %	4.5 %		6.9 %	0.007	3.2 %		4.4 %		6.5 %	0.001
Air emissions	1.4 %	2.0 %		1.4 %		1.4 %		4.4 %		1.2 %	
Quality of the farm environment	1.1 %	2.0 %	0.013	0.6 %		0.9 %		2.2 %		1.1 %	
Soil quality	2.9 %	3.8 %		4.1 %	0.026	0.5 %	0.008	4.4 %		3.3 %	
Landscape	7.6 %	11.4 %	0.000	6.0 %	0.035	12.4 %	0.004	4.4 %		6.5 %	0.026
Biodiversity	9.4 %	10.5 %		8.1 %		8.8 %		6.7 %		10.7 %	0.020
Ground water	0.9 %	1.6 %	0.049	0.4 %		0.9 %		6.7 %	0.006	0.9 %	
Surface waters and nutrient emissions	27.6 %	25.0 %		28.4 %		28.1 %		28.9 %		28.1 %	
Environmental awareness	1.7 %	1.6 %		1.7 %		0.9 %		4.4 %		1.5 %	
Positive environmental effects, total	*49.5 %*	*52.5 %*		*49.0 %*		*47.5 %*		*60.0 %*		*51.7 %*	*0.025*
No impact	9.7 %	6.9 %	0.007	8.1 %		12.0 %		11.1 %		8.5 %	0.035

	Crop portfolio		**Manure mngt. (B+S)**		**Protecting the waterways (S)**		**Nature mngt. fields (B)**		**Promoting biodiversity (S)**		**Organic farming (S)**	
Share of adopters:	17,4 %		11,5 %		14,9 %		41,4 %		16,4 %		11,1 %	
Perceived effectiveness:	**%**	***p***	**%**	***p***	**%**	***p***	**%**	***p***	**%**	***p***	**%**	***p***
Causal mechanism: land use												
Plant and grass cover	10.6 %		12.2 %		8.2 %		12.9 %		4.8 %	0.001	5.6 %	0.017
Nature management fields	5.6 %		3.1 %		2.4 %		8.3 %	0.000	3.2 %		1.6 %	
Filter strips	2.0 %		0.8 %	0.016	5.3 %		4.7 %	0.028	1.6 %		1.6 %	
Riparian zones	5.1 %	0.039	4.6 %		15.3 %	0.000	4.2 %		2.7 %		2.4 %	
Avoiding abandonment	0.0 %	0.044	3,1 %		1.2 %		1.3 %		2.7 %		2.4 %	
Environmental management	1.5 %		2.3 %		4.1 %	0.011	1.9 %		7.5 %	0.000	4.0 %	0.040
Land use effects, total	*24.7 %*		*26.0 %*		*35.3 %*	*0.000*	*32.0 %*	*0.000*	*21.9 %*		*16.7 %*	*0.018*
Causal mechanism: productive practices												
Pesticide use	2.5 %		4.6 %		2.4 %		4.0 %		3.2 %		5.6 %	
Fertilizing practices	15.7 %	0.003	36.6 %		20.0 %	0.019	26.1 %		21.4 %	0.043	13.5 %	0.000
Organic farming	4.5 %		6.1 %		2.9 %		3.0 %		3.7 %		27.0 %	0.000
Changing the production methods	12.1 %	0.000	15.3 %	0.003	5.3 %		7.0 %		3.7 %		4.8 %	
Productive practices effects, total	*30.8 %*		*61.1 %*	*0.003*	*27.6 %*	*0.002*	*36.7 %*		*30.5 %*	*0.017*	*46.0 %*	*0.000*
Final impact												
Erosion	5.6 %		3.8 %		4.7 %		5.7 %		2.1 %	0.026	4.8 %	
Air emissions	1.5 %		6.9 %	0.000	0.0 %		1.1 %		1.6 %		0.0 %	
Quality of the farm environment	0.5 %		1.5 %		1.2 %		0.8 %		2.7 %	0.033	0.8 %	
Soil quality	4.5 %	0.047	5.3 %		4.1 %		3.0 %		1.1 %		6.3 %	0.023
Landscape	5.1 %		9.2 %		7.6 %		7.4 %		20.3 %	0.000	15.1 %	0.002
Biodiversity	13.6 %	0.003	9.9 %		9.4 %		11.4 %	0.030	15.0 %	0.005	15.1 %	0.020
Ground water	0.5 %		2.3 %		2.9 %	0.009	1.3 %		1.1 %		0.8 %	
Surface waters and nutrient emissions	25.3 %		23.7 %	0.002	31.8 %		27.8 %		25.7 %		20.6 %	0.038
Environmental awareness	1.0 %		1.5 %		2.4 %		1.1 %		2.7 %		1.6 %	
Positive environmental effects, total	*46.5 %*		*58.8 %*		*55.9 %*	*0.043*	*48.9 %*		*59.4 %*	*0.002*	*52.4 %*	
No impact	5.6 %		7.6 %	0.047	5.9 %	0.042	7.2 %	0.011	7.5 %		4.8 %	0.028

4 Discussion

This study has offered insights into the factors that the farmers themselves regard as important in the adoption process of agri-environmental measures and their perceptions of the scheme's effectiveness. It is presumable that farmers have reported those reasons that they personally consider to have had the primary effect on their adoption decisions. Based on the adoption behaviour and the motivations given for it, there are differences between the agri-environmental schemes. The measures within the basic-level scheme, the so-called 'broad-brush' measures, are adopted mainly because of production-related factors, while measures within the special scheme, the 'deep and narrow' type of measures, are chosen more equally because of contextual, productive and effectiveness reasons. The differences between the complexity and additionality of the schemes and the adoption motives have been illustrated also by e.g. Lobley and Potter (1998) and Van Herzele et al. (2013). The pronounced role of the productive factors especially in the case of the basic-level measures echoes findings from studies exploring farmer decision-making in general. These studies suggest that retaining the economic viability of farms is an overarching motivation for most of the farmers (Siebert et al. 2006). Thus, especially on the part of broad-brush measures, adoption decisions are judged first and foremost against the effect they have on the productive practices of farms. Other factors such as the environmental effectiveness of the practices also play a role, but this role is complementary to productive reasons. The role of farmers' environmental attitudes in the decision-making has been widely discussed (Burton 2004), but the results of this study suggest that for most of the measures, other factors than personal orientations have a decisive role in the adoption decisions. However, especially organic farming and biodiversity-promoting measures are examples of practices in which some of the adopters may pursue the practices even without any economic incentives. In the adoption literature, these practices have been linked to self-identity issues (Van Dijk et al. 2015) suggesting that the linkages of different practices to different decision-making elements are highly variable.

The pronounced role of the economic incentives in motivating farmers' adoption decisions has sometimes been interpreted to demonstrate farmers' unchanging productivist attitudes and the failure of farmers to engage with more environmentally motivated orientations (de Snoo et al. 2012). The productivist attitudes tend to prevail among farmers, as farming is first and foremost a source of income (Howley et al. 2015). However, the productivist orientation does not necessarily rule out environmental orientations or practicing environmentally friendly agriculture. Based on the results of this study, the environmental and economic factors are not mutually exclusive as adoption motivations. The economic incentives were equally important for the adopters of the special scheme as for the adopters of the basic scheme, although in other dimensions (production-related factors and environmental effectiveness –related factors) the adoption motivations of these schemes were different. The interplay of environmental and economic considerations was especially pronounced in the case of organic farming. Organic farmers often expressed intrinsic environmental motivations for the adoption and considered their way of production as environmentally superior in itself. However, the economic incentives were equally important for the adoption decision. A similar interplay of economic considerations and environmental philosophy in the case of organic farming has been previously reported by e.g. Darnhofer et al. (2005).

The differences in the associations between adoption motivations and practice characteristics were highlighted in the results of this study, as the adoption motivations for the distinct measure categories diverged. For example, the adoption profiles of the measure categories 'optimizing fertilization' and 'reducing fertilization' are divergent, even though all these measures ultimately target the same aims of reducing fertilization and improving water quality. The adoption of practices the fertilization limits of which were based on calculations of the plants' nutrient needs and nutrient balances was motivated by fitness and feasibility perceptions and economic incentives, while adoption of practices with imposed fertilization limits was related to environmental effects, cost-effectiveness, avoiding abandonment and maintaining the agricultural landscapes. These differences suggest that schemes and measures with distinct characteristics recruit different farmers with different strategies (Lobley and Potter 1998). Defrancesco et al. (2008) indicated that an extensification-oriented agri-environmental scheme was more appealing to those farmers who saw the future of their farming uncertain compared to the future- and investment-oriented farmers. The adopters of reduced fertilization measures expressed a similar view on uncertainty by seeing the abandonment of fields as an alternative to continuing their cultivation extensively. Farmers look for fitness between the scheme prescriptions and the existing practices, but achieving the fit depends on various issues – for some farmers strict fertilizer restrictions impede achieving fitness, but optimizing fertilization based on measurements does not – and yet, the target of reducing fertilization may be achieved both ways. For such environmental aims that require as inclusive adoption behaviour as possible it is essential to offer a portfolio of practices that farmers with differing aims find it possible to incorporate the environmental practices into their existing productive practices. The same targets can be strived for with a heterogeneous set of practices. The differences in the motivations imply that farmers adopting different measures have differing strategies and aims concerning farming, but yet the data used here does not reveal the differences in the characteristics of the farmers adopting various measures. This calls for further research paying pronounced attention to the measure prescriptions, farmers' motivations and the structural factors characterising adopter groups.

5 References

Ahnström, J., Höckert, J., Bergeå, H.L., Francis, C.A., Skelton, P. and Hallgren, L. (2008). Farmers and nature conservation: What is known about attitudes, context factors and actions affecting conservation? Renewable Agriculture and Food Systems 24 (1): 38-47.

Baron, J. (2008). Thinking and deciding. 4th edition. Cambridge: Cambridge University Press.

Birge, T. and Herzon, I. (2014). Motivations and experiences in managing rare semi-natural biotopes: A case from Finland. Land Use Policy 41: 128-137.

Burton, R.J.F. (2004). Reconceptualising the 'behavioural approach' in agricultural studies: a socio-psychological perspective. Journal of Rural Studies 20: 359-371.

Burton, R.J.F., Kuczera, C. and Schwarz, G. (2008). Exploring farmers' cultural resistance to voluntary agri-environmental schemes. Sociologia Ruralis 48 (1): 16-37.

Carlisle, L. (2016). Factors influencing farmer adoption of soil health practices in the United States: a narrative review. Agroecology and Sustainable Food Systems 40 (6): 583-613.

Darnhofer, I., Schneeberger, W. and Freyer, B. (2005). Converting or not converting to organic farming in Austria: Farmer types and their rationale. Agriculture and Human Values 22: 39-52.

Defrancesco, E., Gatto, P., Runge, F. and Trestini, S. (2008). Factors affecting farmers' participation in agri-environmental measures: A Northern Italian perspective. Journal of Agricultural Economics 59 (1): 114-131.

de Snoo, G.R., Herzon, I., Staats, H., Burton, R.F., Schindler, S., van Dijk, J., Lokhorst, A.M., Bullock, J.M., Lobley, M., Wrbka, T., Schwarz, G. and Musters, C.J.M. (2013). Towards effective nature conservation on farmland: making farmers matter. Conservation Letters 6: 66-72.

European Commission (2005). Agri-environmental measures. Overview on general principles, types of measures, and application. Directorate General for Agriculture and Rural Development. Unit G-4 – Evaluation of measures applied to agriculture, Studies.

Grammatikopoulou, I., Pouta, E. and Myyrä, S. (2016). Exploring the determinants for adopting water conservation measures. What is the tendency of landowners when the resource is already at risk? Journal of Environmental Planning and Management 59 (6): 993-1014.

Home, R., Balmer, O., Jahrl, I., Stolze, M. and Pfiffner, L. (2014). Motivations for implementation of ecological compensation areas on Swiss lowland farms. Journal of Rural Studies 34: 26-36.

Howley, P., Buckley, C., O Donoghue, C. and Ryan, M. (2015). The economic ‘irrationality’ of farmers’ land use behaviour: The role of productivist attitudes and non-pecuniary benefits. Ecological Economics 109: 186-193.

Hsieh, H.-F. and Shannon, S. E. (2005). Three approaches to qualitative content analysis. Qualitative Health Research 15 (9): 1277-1288.

Huttunen, S. (2015). Farming practices and experienced policy coherence in agri-environmental policies: The case of land clearing in Finland. Journal of Environmental Policy & Planning 17 (5): 573-592.

Huttunen, S. and Oosterveer, P. (2016). Transition to sustainable fertilisation in agriculture, a practices approach. Sociologia Ruralis. In press, doi:10.1111/soru.12118.

Ingram, J., Gaskell, P., Mills, J. and Short, C. (2013). Incorporating agri-environmental schemes into farm development pathways: A temporal analysis of farmer motivations. Land Use Policy 31: 267-279.

Knowler, D. and Bradshaw, B. (2007). Farmers’ adoption of conservation agriculture: A review and synthesis of recent research. Food Policy 32: 25-48.

Kuhmonen, T., Keränen, R., Kytölä, L., Pyykkönen, P., Arovuori, K., Huuskonen, I., Mustonen, V., Ponnikas, J., Salo, H. and Pesonen, H,-L. (2010). Manner-Suomen maaseudun kehittämisohjelman 2007-2013 väliarviointi [Mid-term evaluation of the Rural Development Programme for Continental Finland 2007–2013]. Selvityksiä 40. Sonkajärvi: Suomen Aluetutkimus FAR.

Lastra-Bravo, X.B., Hubbard, C., Garrod, G. and Becerra-Tolón, A. (2015). What drives farmers’ participation in EU agri-environmental schemes?: Results from a qualitative meta-analysis. Environmental Science & Policy 54: 1-9.

Lobley, M. and Potter, C. (1998). Environmental stewardship in UK agriculture: A comparison of the Environmentally Sensitive Area programme and the Countryside Stewardship scheme in South East England. Geoforum 29(4): 413-432.

Läpple, D. and Kelley, H. (2013). Understanding the uptake of organic farming: Accounting for heterogeneities among Irish farmers. Ecological Economics 88: 11-19.

Macgregor, C.J. and Warren, C.R (2006). Adopting sustainable farming practices within a Nitrate Vulnerable Zone in Scotland: The view from the farm. Agriculture, Ecosystems and Environment 113: 108-119.

MAF (2011). Manner-Suomen maaseudun kehittämisohjelman 2007-2013 vuoden 2010 vuosikertomus [Annual review 2010 of the Rural Development Programme for Continental Finland 2007–2013; in Finnish.] Helsinki: Ministry of Agriculture and Forestry.

MAF (2014). Rural development programme for Mainland Finland 2014-2020. Unofficial translation. Ministry of Agriculture and Forestry.

McCann, L., Gedikoglu, H., Broz, B., Lory, J. and Massey, R. (2015). Effects of observability and complexity on farmers’ adoption of environmental practices. Journal of Environmental Planning and Management 58 (8): 1346-1362.

Meyfroidt, P. (2012). Environmental cognitions, land change, and social-ecological feedbacks: an overview. Journal of Land Use Science 8 (3): 341-367.

Micha, E., Areal, F.J., Tranter, R.B. and Bailey, A.P. (2015). Uptake of agri-environmental schemes in the Less-Favoured Areas of Greece: The role of corruption and farmers’ responses to the financial crisis. Land Use Policy 48: 144-157.

Morris, C. and Potter, C. (1995). Recruiting the new conservationists: Farmers’ adoption of agri-environmental schemes in the U.K. Journal of Rural Studies 11(1): 51-63.

Murphy, G., Hynes, S., Murphy, E., O’Donoghue, C. and Green, S. (2011). Assessing the compatibility of farmland biodiversity and habitats to the specifications of agri-environmental schemes using a multinomial logit approach. Ecological Economics 71: 111-121.

OECD (2008). Environmental performance of agriculture in OECD countries since 1990. Paris: OECD.

Pannell, D.J., Marshall, G.R., Barr, N., Curtis, A., Vanclay, F. and Wilkinson, R. (2006). Understanding and promoting adoption of conservation practices by rural landholders. Australian Journal of Experimental Agriculture 46: 1407-1424.

Pavlis, E.S., Terkenli, T.S., Kristensen, S.B.P., Busck, A.G. and Cosor, G.L. (2016). Patterns of agri-environmental scheme participation in Europe: Indicative trends from selected case studies. Land Use Policy 57: 800-812.

Reimer, A.P., Weinkauf, D.K. and Prokopy, L.S. (2012). The influence of perceptions of practice characteristics: An examination of agricultural best management practice adoption in two Indiana watersheds. Journal of Rural Studies, 28: 118-128.

Sattler, C. and Nagel, U.J. (2010). Factors affecting farmers' acceptance of conservation measures – A case study from north-eastern Germany. Land Use Policy 27: 70-77.

Siebert, R., Toogood, M. and Knierim, A. (2006). Factors affecting European farmers participation in biodiversity policies. Sociologia Ruralis 46(4): 318-340.

Schlüter, M., Baeza, A., Dressler, G., Frank, K., Groeneveld, J., Jager, W., Janssen, M.A., McAllister, R.R.J., Müller, B., Orach, K., Schwarz, N. and Wijermans, N. (2017). A framework for mapping and comparing behavioural theories in models of social-ecological systems. Ecological Economics 131: 21-35.

Sutherland, L.-A. (2010). Environmental grants and regulations in strategic farm business decision-making: A case study of attitudinal behaviour in Scotland. Land Use Policy 27: 415-423.

Söderqvist, T. (2003). Are farmers prosocial? Determinants of the willingness to participate in a Swedish catchment-based wetland creation programme. Ecological Economics 47: 105-120.

van Dijk, W.F.A., Lokhorst, A.M., Berendse, F. and de Snoo, G.R. (2015). Collective agri-environmental schemes: How can regional environmental cooperatives enhance farmers' intentions for agri-environmental schmes? Land Use Policy 42: 759-766.

Van Herzele, A., Gobin, A., Van Gossum, P., Acosta, L., Waas, T., Dendoncker, N. and de Frahan, B.H. (2013). Effort for money? Farmers' rationale for participation in agri-environmental measures with different implementation complexity. Journal of Environmental Management 131: 110-120.

Vanclay, F. (2004). Social principles for agricultural extension to assist in the promotion of natural resource management. Australian Journal of Experimental Agriculture 44: 213-222.

Villanueva, A.J., Gómez-Limón, J.A., Arriaza, M. and Rodríguz-Entrena, M. (2015). The design of agri-environmental schemes: Farmers' preferences in southern Spain. Land Use Policy 46: 142-154.

Wauters, E., Bielders, C., Poesen, J., Govers, G. and Mathijs, E. (2010). Adoption of soil conservation practices in Belgium: An examination of the theory of planned behaviour in the agri-environmental domain. Land Use Policy 27: 86-94.

Weber, R.P. (1990). Basic content analysis. Beverly Hills, CA: Sage.

Wilson, G.A. and Hart, K. (2000). Financial imperative or conservation concern? EU farmers' motivations for participation in voluntary agri-environmental schemes. Environmental and Planning A 32: 2161-2185.

Wynne-Jones, S. (2013). Ecosystem service delivery in Wales: Evaluating farmers' engagement and willingness to participate. Journal of Environmental Policy & Planning 15 (4): 493-511.

Zimmermann, A. and Britz, W. (2016). European farms' participation in agri-environmental measures. Land Use Policy 50: 214-228.