



Factors affecting farmers' willingness to participate in eutrophication mitigation — A case study of preferences for wetland creation in Sweden



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ABSTRACT

Local stakeholder participation in water management is emphasized in the EU Water Framework Directive (WFD). Wetland creation to mitigate nutrient leakage from agriculture is one example where participation of local farmers is needed. In this case study of the Himmerfjärden coastal catchment, south of Stockholm, Sweden, we assessed the importance of socio-demographic factors, and of the existing agri-environmental scheme (AES), for their effects on farmers' willingness to create wetlands on their farms. The main factors from the AES were defined as five attributes in a discrete choice experiment approach, related to the current AES for wetland creation in the area. The results showed that approximately 30% of the farmers were interested in wetland creation. A common reason for not wanting to create wetlands was cost incurred by the farmer. Males were significantly more willing than females to create wetlands. Prior knowledge of the WFD increased willingness almost threefold, and land owners were significantly more willing than leaseholders. The choice experiment showed that higher cost ceiling for compensation, compensation percentage and annual subsidies can significantly increase the willingness to create wetlands. However, other options like result-oriented AES may be taken into consideration to attract the remaining 70% of all farmers.

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1. Introduction

Agriculture is a highly multifunctional system dependent on and affecting a wide range of ecosystem services in the landscape (Daily, 1997; Foley et al., 2005; Millennium Ecosystem Assessment, 2005). During the 19th and 20th centuries, human impact on wetlands increased in several European countries due to drainage for agriculture purposes, peat cutting, and river regulation, resulting in substantial wetland loss. The open plains of south-western Sweden, lost 67% of their wetlands and ponds due to drainage during the last 50 years (Silva et al., 2007). The great loss of wetland ecosystem services has now resulted in restoration and construction of wetlands to be prioritized environmental goals, primarily to increase biodiversity and decrease eutrophication both at the national level in Sweden and at the EU level, e.g. the Habitats and Water Framework Directives (European Commission, 2003; Swedish Board of Agriculture, 2004). The possibilities to reach these goals are largely dependent on voluntary participation by landowners (Falconer, 2000; Hansson et al., 2012).

Stakeholder participation has become increasingly important for water management in Europe after the adoption of the EU Water Framework Directive (European Parliament, Council, 2000). To

stimulate participation in agri-environmental programs, a number of national policy instruments are used including agri-environmental subsidy schemes (AES) encouraged by the Swedish rural development program (Landsbygdsprogrammet) under the EU Common Agricultural Policy (CAP) (www.jordbruksverket.se). These schemes are mainly action-oriented, paying farmers for the delivery of land management practices, as opposed to result-oriented schemes focusing on the achievement of certain environmental outcomes (Burton and Schwarz, 2013).

Subsidies for wetland creation on agricultural land have been available since 1996 in Sweden. The current policy instrument for wetland creation is part of the Swedish rural development program, where wetland construction for efficient nutrient retention is prioritized. In the Baltic Sea, approximately 50% of the total inputs of nitrogen, and 30% of total inputs of phosphorus originate from agriculture (Arheimer et al., 2012). Hence, farmers are a key stakeholder group for reaching the goal of wetland creation and reducing eutrophication. Criteria for receiving support include high levels of eutrophication, low natural remediation, and short distances to the recipient (Swedish Board of Agriculture, 2004). A common problem with AES is that they attract too few participants (Vanslebrouck et al., 2002; Polman and Slangen, 2008), and that it often is difficult to predict farmers' willingness to participate in AES (Hansson et al., 2012). Also in Sweden, the willingness to participate in wetland creation has so far been too low to reach the national targets. Between the years 2000

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and 2010 the Swedish goal was to produce 12,000 ha of new wetland, but only 7654 ha were actually created (Swedish Environmental Protection Agency, 2011).

Different explanations of why farmers decide not to participate include inadequate financial incentives and personal business considerations (Falconer, 2000; Hansson et al., 2012). Also, scheme design in terms of contract length, flexibility, and amount of time spent on administration has been identified as important factors (Ruto and Garrod, 2009; Espinosa-Goded et al., 2010; Christensen et al., 2011).

Recent research has begun to investigate background factors, including farm and farmer characteristics that might be driving farmers to participate in AES (Espinosa-Goded et al., 2010; Christensen et al., 2011; Beharry-Borg et al., 2013). Vanslebrouck et al. (2002) found that younger, higher educated farmers with previous experience of AES and larger farms were more willing to participate in AES. Polman and Slangen (2008) showed that farmers with low trust in the government were less likely to commit to EU agri-environmental contracts. Burton et al. (2008) suggested that resistance against AES follows from cultural resistance, where the AES failed to allow farmers to perform their skills in agriculture. Hansson et al. (2012) pointed to the significance of the farmers' knowledge, understanding, and sense of responsibility for environmental impacts. Söderqvist (2003) identified public benefits as a driver for participating in wetland creation in Sweden. Even so, Lundqvist (2001) and Blomqvist (2004) both showed that farmers participating in local water programmes found it difficult to perceive their benefits of participating in collective action for public goods. In particular, this was true when those who benefited from the farmers' activities lived outside the focal area. Hence, the explanatory factors for farmers' attitudes to AES in general, and to wetland creation in particular, are still ambiguous. To our knowledge, except for Söderqvist (2003), there exists no other studies from Sweden on farmer demography and opinions, in relation to farmers' willingness to create wetlands on their farms.

The aim of this study is to analyze farmer preferences for wetland creation using the coastal Himmerfjärden catchment in Sweden as a case study. Himmerfjärden catchment provides an interesting and relevant case in one of the most intensive agricultural areas of Sweden, with a range of different types of farming activities. As a coastal area close to the eutrophic Baltic Sea it is also a suitable area for wetland creation.

Firstly, we analyze the importance of farm and farmer characteristics for the willingness of farmers to create new wetlands on their land. Secondly, we study the effect of varying levels and combinations of the different components of the current policy instrument for wetland creation, used in Stockholm County, Sweden. Specifically, we test the effect of farmer demography in terms of gender, age, and education. Farm characteristics include property right arrangements, farm size, farm type, earlier environmental measures, as well as farmer characteristics including knowledge of the WFD, and trust for authorities and other farmers. To analyze farmers' preferences for the AES for wetland creation we use a discrete choice experiment approach (Christensen et al., 2011) testing current levels of the attributes of the policy instrument in Stockholm County. In particular, we focus on the following two research questions (i) do farm and farmer characteristics explain farmers' willingness to create wetlands; and (ii) which factors used in the existing policy instrument are most important for enhancing farmers' willingness to participate in wetland creation?

2. Materials and Methods

To analyze the importance of different incentives to encourage farmers to participate in agri-environmental schemes to enhance ecosystem services, we used an existing AES program to stimulate wetland creation in the county of Stockholm as a starting point. This AES contained both economic and administrative incentives

meant to encourage farmers' voluntary participation in a program for wetland creation.

2.1. Case Study Area

The coastal area of Himmerfjärden is situated between the Trosa River and Tyresö River catchments close to urban centres in Stockholm County in the North Baltic River Basin District (NB RBD), Sweden (Fig. 1). Approximately 15% of Stockholm County is agricultural land, and only 4–5% is wetlands. This is below the average proportion of wetlands in most other parts of Sweden (Stockholm Country Board, 2006). There are approximately 300 farms in the case study area, representing a large variety of different farm types ranging from grain farming only to farms with various types of livestock, and horse farms.

In the case study area there is also a large sewage treatment plant, processing wastewater from approximately 314,000 persons by the Himmerfjärden bay. The population in the entire catchment is close to 100,000. Approximately 76% of the water bodies in the area are affected by eutrophication and 60% of the water bodies are affected by diffuse sources of nutrients from agriculture (www.viss.lansstyrelsen.se). The Himmerfjärden bay is heavily eutrophicated and identified as a prioritized area for reduction of both nitrogen and phosphorus in the WFD Program of Measures (PoM) for the River Basin District, 2009–2015, as well as by the Stockholm County Board (North Baltic River Basin District, 2009). The reduction demand for Himmerfjärden catchment is for example 75% for nitrogen. The Stockholm County Board has appointed the area as a 'hot spot' for wetland creation (Stockholm Country Board, 2006).

2.2. Data Collection

Demographic, and background data was collected with a questionnaire that included questions of characteristics of the farmer, the farm, suggested measures, and potential support for the measures (for an overview of questions, see appendix A). Stockholm County Board provided a list of 307 properties in the area registered as 'agricultural property'. 30 of these farms were randomly chosen for a pilot study. This yielded 12 responses which were used to adjust the questionnaire. The initial version of the questionnaire was also tested by representatives for the local LRF (the Swedish Federation of Farmers), two local land-owners/farmers from a reference group linked to the research project and an official at the Stockholm County Board responsible for wetland management. The finalized version of the questionnaire was sent to the remaining 277 farmers in the case study area. Out of these, 18 responses were received incomplete due to incorrect address, the respondent had deceased, or that there were no longer any farming activities on the property. Of the remaining 259 farms, 135 complete responses were received which gave a response rate of 52%.

The first section of the questionnaire was divided into three subsections containing questions about: (a) farmer and farm characteristics: age, sex, education, farm size, farming activity, farm type, ownership; (b) trust for different actors from regional to local level: municipality, county board, other farmers; (c) on-going and future management actions to reduce nutrient leakage: current knowledge, buffer zones, reduction of N-load. Sub-section (c) was concluded by a yes/no-question about the respondents' willingness to create a wetland on her/his farm. Respondents who answered "no" were asked to fill in reasons for the unwillingness to create wetlands. Respondents who answered that they were willing to create a wetland were asked to continue to section two in the questionnaire about the policy instrument for wetland creation. Out of a total of 42 respondents interested in wetland creation, 29 respondents filled in the entire section two. These respondents are not a random sample of the total population of farmers in the studied region, but they can be regarded as a representative subsample of farmers that are willing to create a wetland.

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