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Responding to environmental regulations through collaborative arrangements: Social aspects of manure partnerships in Denmark

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ABSTRACT

In livestock-intensive regions of Europe, on-farm application of manure and other fertilisers is being increasingly regulated to protect aquatic environments. This study examined collaborative arrangements between intensive livestock farms in Denmark with surplus manure and farms requiring crop nutrients, in order to manage the manure resource at landscape scale and comply with environmental regulations. The extent of collaborative arrangements for manure among Danish farms was explored at national scale using registry data. This showed that in 2009, 50% of all farms in Denmark, managing 70% of the area, were involved in manure exchange, indicating that collaborative arrangements are widespread. Based on this analysis, a sample of 1500 livestock farmers who had provided manure to others was selected for a survey to determine the nature of the manure arrangements in terms of which farmers make partnerships with, and how the arrangements function in practice. Multivariate analysis (multiple correspondence analysis and cluster analysis) of 644 respondents was used to identify specific types of manure partnerships. The vast majority of respondents knew their partner before they established the arrangement, either through family, neighbours or their local or professional network. These different social relations played an important role in defining four types of partnerships, differing in e.g. burden sharing of manure transportation and spreading, frequency of communication and transport distance. The four types identified provide additional information about decision-making on manure allocation, which to date is mainly based on spatial-economic models.

1. Introduction

Nitrogen leaching to the aquatic environment has been an ecological and political challenge for decades, and a number of EU Directives, international obligations and related national legislation have influenced agricultural practices, especially in livestock production systems (Nørring and Jørgensen, 2009; Mikkelsen et al., 2010).

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Fulfilling the targets of the European Nitrate Directive (91/676/EEC) and the Water Framework Directive (2000/60/EC) has required governments to take action against excessive application of manure and other fertilisers. While phosphorous is also increasingly realised as a problem for the aquatic environment, no EU regulation aims specifically at that. Denmark has designated all its territory as Nitrate Vulnerable Zone (NVZ) according to the Nitrate Directive. Consequently, since 1991, Danish regulations have included a mandatory nitrogen quota system on farm level, based on nitrogen norms for individual crops and requirements for nitrogen utilisation in various types of livestock manure (Kronvang et al., 2008). Farmers are obliged to submit annual fertiliser accounts to the authorities, reporting on produced, applied, received and provided fertiliser and manure. Farmers have had the option to establish partnerships with other farmers in order to adjust the balance between land available and manure produced as an integral and formal part of the regulations. As a result of this, partnerships between intensive livestock farms with surplus manure and farms requiring plant nutrients, e.g. stockless arable farms, are now widespread in Denmark. This also has implications for the fertilisation with phosphorous through manure, while general regulation of phosphorous only addresses areas draining to aquatic Natura 2000 sites. In other livestock-intensive regions in Europe, various ways of handling surplus manure are also in development, ranging from collective transfer and spreading plans for slurry in collaboration with arable farmers from neighbouring regions in Brittany, France (Lopez-Ridaura et al., 2009) to farm-level manure arrangements in NVZs in the UK (DEFRA, 2009). The level of manure disposal from the farms is also large in e.g. the Netherlands and Belgium (around 50% in the Netherlands), but there, a considerable share is allocated long distance and to other countries, which is not the case in Denmark (Oomen, 2012). From a policy implementation perspective, providing farmers with the option to collaborate to comply with nitrogen regulations has been an attempt to address the problem of farm-level nitrogen surplus on the appropriate spatial level, the landscape. The experiences gained by Danish farmers within the past decade on manure partnerships therefore may contribute to these emerging practices.

Information relating to collaboration among farmers as a response to mandatory regulations is scarce. Many studies on collaboration between farmers focus on groups of farmers acting jointly on regulations or other local and regional issues, e.g. environmental cooperatives involved in nature and landscape management, water management or agro-tourism (Renting and Van Der Ploeg, 2001). For the success of cross-farm cooperation in delivering landscape-scale resource management, the way farmers perceive the collaboration and the other partners is a distinguishing factor. For instance, Mills et al. (2011) applied the concept of 'collective action' as an analytical framework to understand how individual farmers come together to provide public goods, and the conditions that make this activity a success. Collective action implies that farmers perceive themselves as a group, acting or responding jointly with respect to a joint problem or resource (OECD, 2013). The findings of Mills et al. (2011) confirmed that social relationships are important, since in-depth interviews with 20 members of two co-operative initiatives in Wales revealed that working with group members who were previously acquainted with one another facilitates the organisation and implementation of environment management. The way farmers perceive themselves as a group is also important in joint market initiatives where farmers collaborate with other farmers to improve market access, farm incomes and the contact to consumers. Although a number of case studies are available, most of them involved not only farmers, but also processors, retailers or consumers which make the collaboration distinct from the farmer–farmer collaboration examined in the manure partnerships (Kottila and Rönni, 2008; Renting et al., 2003; Milestad et al., 2010).

Other studies on farmer collaboration focus on farmers or land managers collaborating to achieve ecosystem services which require spatial coherence and where management on farm level is inadequate. For example, Goldman et al. (2007) use the concept of 'cross-farm cooperation' to illustrate how the provision of landscape-level ecosystems services, e.g. pollination, may be secured. Similarly, the concept of 'cross-boundary coordination', i.e. land management that spans practices on adjacent or nearby properties and which seeks to alleviate negative effects of an ownership-centric approach, has been used in forestry in relation to place-dependent ecosystem services (Gass et al., 2009). Thus both these types of study focus on partnerships for management within a spatially restricted area. In the case of the manure partnerships studied here, the above mentioned concepts may not be applicable since participating farmers do not see themselves as 'a group acting together' and are not spatially restricted to the same degree. Thus the broader concept 'collaborative arrangements' is used here to indicate that we are dealing with farmers making arrangements with the purpose of fulfilling mandatory nitrogen regulations.

With respect to manure arrangements among farms, a group of studies assumes that partnerships are optimised for reasons of economy and efficiency, meaning that a manure partnership should be conducted with minimum transaction costs while achieving maximum nutrition use efficiency for crop production (e.g. Andersson et al., 2005; Jacobsen et al., 2005; Fujimoto and Tsunekawa, 2007). For instance, Nauta et al. (1999) simulated efficiency of resource use and farm profitability by exchanging organic dairy manure for organic fodder/straw among nine case organic farms in the Netherlands. Their conclusion from bio-economic models was that high resource use efficiency can potentially be achieved if resource and labour transfers are conducted in optimum forms through collaborations. In intensive livestock production areas of North America and Europe, spatial-economic models have been also developed to address the problem of farm-level nitrogen surplus on the appropriate spatial levels of landscape and region (Aillery et al., 2009; Kang et al., 2008; Paudel et al., 2009; Van der Straeten et al., 2010). Combined with Geo Information Systems (GIS), spatial-economic models were able to estimate a minimum net cost of manure allocation among multiple farms under possible policy provisions