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Land-use change in southern Sweden: Before and after decoupling

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ABSTRACT

Rural land-use in the European Union (EU) is strongly influenced by the Common Agricultural Policy (CAP) because it directly affects the relative profitability of different land-use options. Since 2000, the CAP has been heavily reformed. In particular, in Sweden, the 2003 CAP reform was followed by substantial shifts in agricultural land allocation. However, this land-use change has barely been studied empirically beyond the net changes of land-use categories. In order to better understand the transformation of the land-use system, all transitions between land-use categories and changes within existing categories need to be considered. This article presents an analysis of agricultural land-use change between 2002 and 2010 in a landscape in southern Sweden. The inter-category land transitions were identified and quantified by using a spatially explicit field-level resolution dataset. The intra-category change of utilization intensity was assessed for grasslands by using standard yields and forage consumption estimates. Substantial shifts in chains of connected inter-category land transitions were found between cereals, temporary grasses, permanent pastures and fallow lands. The grassland utilization analysis showed a growing gap between grassland area and forage consumption. These results indicate concentration of agricultural production to better quality land and a growing number of land-idling farms in the region. The CAP single farm payment scheme is discussed in the light of these findings.

Introduction

The Common Agricultural Policy (CAP) is a major factor affecting agricultural land-use in the European Union (EU). Since 2000, the CAP has undergone some serious transformations: Agenda 2000, "decoupling" in 2003 and the continued effort toward phasing out remaining product support in the following years. Agenda 2000 aimed at further integration of agricultural market and price policy with rural development. Consequently, the CAP was divided into two pillars: the first embracing product and producer support, the second-rural development policy. Also support for environmentally friendly farming practices was thus incorporated into the CAP. The 2003 reform became a major turning point, breaking the link between support payments and production for most of the products. Now farmers were to receive direct payments based on the area of agricultural land, decoupled from production. In order to qualify for support, the so-called cross-compliance requirements, including good environmental and agricultural condition (GAEC) of land, had to be fulfilled (Phelps, 2007). It was expected that the decoupling would further reduce the overproduction of agricultural products by exposing farmers to market forces (Britz et al., 2006; Phelps, 2007). Indeed, in the EU at large, the production surpluses for several important sectors and exports decreased significantly compared to the pre-decoupling levels (COM, 2011a,b). Effects of the 2003 CAP reform on land-use were projected ex-ante in a number of studies. Some analyses were carried out for the EU (15 or 25) at the resolution of individual member states (see, for example, Britz et al., 2006; or a review of Balkhausen et al., 2008). Other studies used bottom-up modeling and presented simulations for selected case study areas (for example, Brady et al., 2009; Piorr et al., 2009). Now, half a decade after the implementation of the CAP reform of 2003, little attention is paid to analyzing the actual land-use change as it happened (one such study is Nitsch et al. (2012)). This paper adds to this literature by examining land-use transitions in an area in southern Sweden.

The future of agricultural land, particularly natural grasslands, has traditionally been central to the concerns about the loss of environmental and cultural values associated with rural landscapes in many parts of Sweden (Drake, 1999). Moreover, recent years have witnessed a revived interest by the authorities and the energy sector in the use of agricultural land for energy crop cultivation. An investigation commissioned by the government and several scientific publications presented assessments of the potential energy-biomass supply from agricultural land in Sweden (Borjesson and Gustavsson, 1996; Johansson and Lundqvist, 1999; SOU, 2007). At the same time, agricultural land-use allocation was undergoing a substantial change. Table 1 shows how it changed in Sweden in comparison to the EU15.

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Table 1
Change in agricultural land-use allocation in Sweden and EU15 between 2002 and 2010.

	Sweden	EU 15
Arable land	−2%	−3%[†]
Cereals	−15%	−5%[‡]
Temporary grasses and grazings	+23%	No data
Permanent pastures	−6%	−7%[‡]

Source: Eurostat (2012).
[†] 2001–2008.
[‡] 2002–2009.

In Sweden over the past decade, the decrease in the area of cereals was much higher than in the EU15 on average; the change in total amount of arable land and permanent pastures was almost the same. The area of temporary grasses and grazing increased by as much as 23% in Sweden, whilst no figures are available for the EU (Eurostat, 2012). Even within the country, there are remarkable differences due to climatic, soil and structural factors. Not only can the magnitude of the net change be region-specific but also the character of the underlying land-use transitions. Nitsch et al. (2012) described how, in western Germany, permanent grasslands have decreased through conversion to cropland, whilst in the forest-dominated landscapes in Sweden, conversion of permanent grasslands is generally associated with afforestation. These land transitions cannot be derived from aggregate land-use statistics which show net changes only.

Another land-use issue that is debated in Sweden is the so-called passive farming, a term which refers to farms that leave all their land fallow or idle whilst continuing to receive CAP payments. Among the critical voices are, for example, the Swedish Agricultural Leaseholders Association (Johansson and Jakobsson, 2007) and the Dairy Association (Larsson, 2011), who are concerned with the lock-in situation in the land rental market, along with the Swedish Bioenergy Association, who are concerned with the difficulty of promoting energy crops (Nystrom and Kaberger, 2007). Even the Swedish minister for agriculture has repeatedly stated that no general CAP support should be paid to passive farmers (e.g. Birgerson, 2010). The exact extent of passive farming in Sweden is unclear. However, it is obvious that the extent of land idling goes beyond the area reported as fallow in the arable land utilization statistics. The evidence of the management on the ground as well as the decreasing number of ruminant animals suggests an underutilization of temporary grasses on arable land. However, it has not been fully reflected by the statistics because the temporary grassland categories (there are several) allow for a large variation of the intensity of land management i.e. the definition is based on the state of land rather than on its use.

Thus, there is a need for more comprehensive land-use change analysis to provide a more complete assessment of the impacts of CAP reforms and to help address land-use issues in the future. This study analyzes agricultural land-use transitions over the last decade in a forest-rich landscape in southern Sweden. The study area, Kronoberg County, is located at the heart of a densely forested region of southern Sweden, which in the official agricultural land zoning language is referred to as "forest districts in Götaland". In this region, conditions for agriculture (especially crop cultivation) are rather poor in general and the land ownership structure is marked by small-scale holdings. Presumably, there are increasing numbers of farmers who give up agricultural production while nevertheless managing their land for CAP cross-compliance. At the same time, this is a region where the concerns about grassland biodiversity and landscape openness are especially pronounced and afforestation of agricultural land, especially with spruce, is controversial. A GIS dataset with a resolution down to individual fields is used to track the land-use shifts at field level over the entire study area. Based on these data, land-use transitions between the pre-decoupling time (2002), soon after the decoupling time (2006) and at present (2010) are calculated. Then, the proportion of utilized grassland area is estimated at each point, based on the statistical data on livestock numbers. The results are used to discuss the overall pattern of the regional land-use change and how it was affected by the CAP.

The following sections describe in detail the approach and the data used in the GIS analysis of land-use transitions and the results, which are followed by a method evaluation and a discussion of the findings.

Materials and methods

Definitions

The definitions of land-uses might differ between countries and are sometimes ambiguous. In Sweden, the distinction between the so-called permanent pastures and other grasslands is the most problematic. Basically, pasture is defined as "land that is used or is suitable for using as pasture and is not suitable for plowing" as opposed to arable land, which "is used or is suitable for using for plant cultivation or pasture and is suitable for plowing" (Jordbruksverket, 2008). Thus, the main criterion for distinction between temporary grasses on arable land and permanent pastures[1] lies in the lands' suitability for plowing. Such distinction is, of course, largely judgmental. It is usually also implied that permanent pastures have been used extensively, without the application of fertilizers, for a long time. Permanent pastures are typically marked by specific plant communities (often valuable from a nature conservation point of view) that have developed over long periods of extensive use. In some research articles, different terms can be found. For example, Brady et al. (2009) wrote about semi-natural grasslands in a Swedish case-study area. For studies of grassland utilization, the distinction between permanent pastures and temporary grasses on arable lands is important because of substantial differences in the assumptions regarding grass yields. In this study, we consequently use the official definitions of land-uses and their English official translations.

Study area

The study area covers Kronoberg County, southern Sweden (Fig. 1). The total area of the county is 9429 km^2. The bedrock in the area is predominantly granite and gneiss with the soil mostly till (Freden, 1994). Mean precipitation for the area is 600–700 mm per year and the mean annual temperature is 6 °C, with a July mean of 16 °C and a January mean of −3 °C (Alexandersson and Eggertsson Karlström, 2001).

The landscape is notable for the abundance of forests with only about 10% of the total land area used for agriculture. Currently, the agriculture is predominantly dairy and meat farming (51% of all enterprises). Of the remaining farms, about 9% specialize in crop farming, 4% are classified as pursuing mixed farming and 36% are smallholdings, a designation that implies a labor input of less than 400 man-hours a year. The average size of a holding is about 19 ha of arable land (29 ha including pasture).

The main agricultural uses for land are, in order of percentage of area, temporary grasses on arable land for hay and grazing, permanent pastures and finally cereals. The next largest use is the cultivation of green fodder (excluding grasses) which only uses some 2.4% of the arable land. The tendencies of the development

[1] Official terminology used by the Swedish Board of Agriculture.