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Land Use Policy

journal homepage: www.elsevier.com/locate/landusepol



Changing land use intensity in Europe – Recent processes in selected case studies

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ARTICLE INFO

Article history:

Received 27 January 2014

Received in revised form

21 November 2014

Accepted 14 December 2014

Keywords:

Land use intensity

Intensification

Extensification

Landscape structure

Land abandonment

ABSTRACT

In recent decades the intensification of agricultural production in many European countries has been one of the key components of land-use change. The impact of agricultural intensification varies according to national and local contexts and a greater understanding of the drivers of intensification will help to mitigate against its negative impacts and harness potential benefits. This paper analyses changes in land use intensity in six case studies in Europe. A total of 437 landowners were interviewed and their responses were analysed in relation to changes in land use intensity and agricultural production between 2001 and 2011. In the case studies in Western and Eastern Europe we observed stabilisation during the last decade, and no clear tendency of increase or decrease of land use intensity. The use of fertilizers and pesticides seems to have decreased in our cases in Western Europe, which is contrary to trends in Eastern Europe. Agricultural production remained stable in almost all cases, except for an increase in Austria and Romania which may indicate that the farming efficiency has increased. A statistical analysis showed a division between study areas in Romania and Austria (increasing land use intensity) versus those in the Netherlands, Denmark and Greece (decreasing). In the Mediterranean cases we observe a process where agriculture is becoming increasingly marginalised, at the same time as changes in function with regard to urbanisation and recreational land uses have taken place. Logistic regression highlighted the importance of farm size and farmer type in understanding changes in land use intensity. The dominant pattern of stabilisation which has occurred over the past 10 years may also partly be a result of effective EU and national environmental and agricultural policies, which are increasingly concerned with improving environmental conditions in rural areas.

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Introduction

Trends in intensification and extensification of land use

Since the Second World War, the two dominant processes in agricultural land-use in Europe have been agricultural intensification and specialisation on the one hand and agricultural marginalisation and land abandonment on the other hand (Andersen, 2009; Brouwer, 2006). Both processes have involved a move away from the traditional forms of low-input, labour-intensive crop and livestock production on small to medium-sized farms which, for decades, were prevailing characteristics of rural landscapes all over Europe (Baudry et al., 2000; Klijn, 2004; Kristensen, 1999). Intensification and specialisation are partly a

result of technological progress stimulated by economic, political and social events. The associated developments are manifold; an increase in the use of agro-chemical inputs, mechanisation, specialisation of mixed farmers, efficient land re-allotment, buy-out of small farmers, scale-enlargement and an open European internal market protected by import levies and subsidies. Perhaps the most distinct visual change has been the removal and degradation of (semi-) natural landscape elements (Brussaard et al., 2010). Land use intensification negatively affects environmental quality and biodiversity (Petit and Elbersen, 2006) and leads to encroachment onto natural areas (Brussaard et al., 2010). The increasingly mono-functional agricultural landscapes are 'designed' for agricultural production with limited capacity to provide non-commodity services (Baudry et al., 2000; Burel et al., 2013). In addition, land

<http://dx.doi.org/10.1016/j.landusepol.2014.12.005>
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Please cite this article in press as: van der Sluis, T., et al., Changing land use intensity in Europe – Recent processes in selected case studies. Land Use Policy (2015), <http://dx.doi.org/10.1016/j.landusepol.2014.12.005>

use intensification has led to an on-going homogenisation, scale-enlargement and an increase in land productivity (Firbank, 2005).

Traditional landscapes were typically a product of 'low-intensity land-use (Plieninger et al., 2006). Land use intensification resulted in profound changes in the traditional landscape: uncultivated areas were taken into production and transformed into large and production-efficient parcels, easily accessible for machinery. This resulted in a domination of large fields of relatively monotonous cultivated land (Kristensen, 2003). However, elsewhere extensification occurred, a process where nutrient and labour inputs decrease, which leads to marginalisation of farming and land abandonment. Land abandonment occurs in regions where current land use is not economically viable anymore, and often farming continues as a part-time activity, or with involvement of (cheap) family labour (Duarte et al., 2008). Hobby farming in particular results more often in land abandonment. Marginalisation of farming is considered to be 'a process, driven by a combination of social, economic, political and environmental factors, by which certain areas of farmland cease to be viable under an existing land use and socio-economic structure' (Baldock et al., 1996, p. 36). In mountainous regions or in Eastern Europe more 'non-productive' or less productive 'marginal' land was left unchanged (Andersen et al., 2003; Baldock et al., 1996; MacDonald et al., 2000).

Landscape change processes

Intensification or extensification processes affect landscape identity but also landscape character and biodiversity (Stanners and Bourdeau, 1995; Stobbelaar and Pedroli, 2011). Tschamtker et al. (2005) observe that biodiversity declines in already intensively used agro-ecosystems due to further intensification and technological innovations. To mitigate these negative impacts, it is important to identify and determine the key elements of land use intensification and extensification processes, and adjust policies where necessary (Plieninger et al., 2006). The processes (and speed) of land use change may be strongly influenced by national and EU policies such as the Common Agricultural Policy (CAP) and the Least Favoured Area policy (LFA) (Primdahl et al., 2004). The policies may be the same across Europe, but differences in governance culture (Nielsen et al., 2013), in combination with a situation in Europe where policy develops and is implemented at different speeds and in relation to different environmental conditions, may lead to regions where different landscapes and economies evolve. Based on these observations, one would expect a decrease in land use intensity in some areas (in particular in marginal areas), in other areas an increase. We therefore hypothesise that, in Europe, different patterns will emerge (Plieninger et al., 2006): where good farming conditions prevail, farming will remain an important economic activity; in areas with (severe) natural limitations farming will decline and areas will eventually depopulate, if no new functions develop. In newly developing economies, industrialisation of farming may take place which will dominate land use changes (Baumann et al., 2011; Kuemmerle et al., 2009; Plieninger et al., 2006; Wascher et al., 2008). In North-Western Europe we therefore expect intensification and specialisation of farming, in Southern Europe further marginalisation. Eastern Europe has the potential to grow as an area of agricultural production thanks to favourable farming conditions and the removal of barriers related to trade and policy.

This paper provides an analysis of changing land use intensity in six case study areas in different area in Europe: Romania, Austria, Greece, Italy, the Netherlands and Denmark. This is carried out in the framework of a broader study of land use transitions in Europe (submitted, this issue; Rounsevell et al., 2012). Within the case study areas the changes in land use intensity and the underlying decisions are studied at farm level. Based on the observed trends the

impact on the future landscape is discussed. The key question we address in this paper is whether land use has become more or less intensive in different regions in Europe, and whether there are general patterns emerging for different regions in Europe. Finally we discuss what implications this may have for the future landscape.

Cases, data and methods

Case study areas

The data for this paper was collected in the spring of 2012 through a questionnaire survey in 6 case study areas: Roskilde (Denmark), Heerde (The Netherlands), Portofino (Italy), Lesvos (Greece), Reichraming (Austria) and Rătești and Stăncuța (Romania). These case studies represent areas with different levels of rural development, from 'deep rural' to 'peri-urban' in the FARO typology (Van Eupen et al., 2012) and represent a cross-section spanning from peri-urban to marginal rural landscapes (Kristensen et al., 2013). They cover the diverse landscapes in Europe and are therefore well-suited for illustrating the variety of processes and patterns of land use intensity in Europe. The environmental conditions vary; they are classified as Atlantic, Continental, Alpine and Mediterranean zones (Metzger et al., 2005) which differ in particular in temperature and degree of oceanic gradient. The areas are described in more detail elsewhere in Kristensen et al. (2013) and in Van der Sluis et al. (2013, 2014). The socio-economic conditions also vary and we can ordinate the study areas within the divisions provided by the FARO typology (Van Eupen et al., 2012, Fig. 2), as explained in Fig. 1.

Based on the FARO typology, the extreme positions (considered from lower left to upper right in Fig. 1) are taken by Stăncuța, which is 'deeply rural' with low economic density, and Roskilde which represents the most peri-urban area in terms of accessibility and economic development levels. Lesvos shares more characteristics with Heerde and Reichraming as rural, with average economic density; the high economic density relates to the west of Lesvos, Mytilini and the infrastructure along the coast; the inland territories show much less development. Although the local area surrounding the Portofino case area is considered to be peri-urban (proximity to large town and highway), access to the case area is difficult; the Regional Park designation restricts agricultural activities and the area shares many characteristics with marginal agricultural areas including an ageing population and a lack of investments (Pedroli et al., 2013). For these reasons we will consider the case area as marginal/deep rural, even if the FARO typology, which uses a coarser geographical resolution, designates it as peri-urban.

In Kristensen et al. (2013) and Van der Sluis et al. (2013) key characteristics are provided for each case study area. The smallest area is Portofino (only 18 km²), the largest Stăncuța (255 km²). The Heerde and Reichraming areas are mainly livestock farming areas, with a limited area of arable crops, Roskilde has mostly arable farming. Portofino and Reichraming have predominantly a forest cover. For basic statistics for the different areas, see Kristensen et al. (2013). The Portofino, Lesvos and Reichraming areas can be classified as traditional land use systems (low intensity tree crops and low-intensity livestock raising in mountain areas) according to Plieninger et al. (2006). The Roskilde, Heerde and Stăncuța cases would qualify as intensifying regions. Still, this classification seems to neglect the urban pressure, which strongly affects farming in an area like Portofino, and which is reflected in the FARO classification.

Data collection and statistical analysis

Data were collected from 437 landowners. In most cases, questionnaires were completed in face-to-face interviews while in

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