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effects of policy development on landscape

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Published in:
Living landscape

Publication date:
2010

Document version
Early version, also known as pre-print

Landscape Research
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/clar20

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Published online: 09 May 2013.

To cite this article: Jørgen Primdahl, Erling Andersen, Simon Swaffield & Lone Kristensen, Landscape Research (2013): Intersecting Dynamics of Agricultural Structural Change and Urbanisation within European Rural Landscapes: Change Patterns and Policy Implications, Landscape Research, DOI: 10.1080/01426397.2013.772959

To link to this article: http://dx.doi.org/10.1080/01426397.2013.772959

Landscape Research, 2013
http://dx.doi.org/10.1080/01426397.2013.772959

Intersecting Dynamics of Agricultural Structural Change and Urbanisation within European Rural Landscapes: Change Patterns and Policy Implications

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ABSTRACT *European rural landscapes are, with few exceptions, characterised by farming and forestry as key functions. Whilst farming has been dominant historically and is still a significant dynamic in most regions, urbanisation is also a vital factor. This involves rural–urban emigration, urban expansion and migration from cities into the countryside (counter-urbanisation). A conceptual framework for the analysis and understanding of change patterns in European rural landscapes is presented and then applied at two spatial scales. First, the combined effect on local landscapes of agricultural structural changes and counter-urbanisation is analysed using data from two Danish case studies. Second, their expression at a wider European scale is explored using available regional statistics. Research and policy implications of the change patterns are identified and discussed, highlighting data limitations and challenges of managing the organisational and regulatory interface between local landscapes and international market policy institutions*.

KEY WORDS: European landscapes, dynamic interrelationship, changing functions, structural adjustment, counter-urbanisation

Introduction

Historically, the political and socio-economic factors shaping European landscapes express differentiation by region and by state—particularly in law and policy (Olwig, 1996). Resulting rural landscapes also reflected natural conditions for agriculture and different regional traditions of agriculture and forestry. However, cheap energy, combined with agricultural modernisation, to a large extent supported by the Common Agricultural Policy (CAP) (or equivalent national policies), became important factors reducing regional differences during the second half of the twentieth century (Jongman, 2002). Over the past few decades, globalisation of finance and information (Harvey, 2000) and creation of global systems of food production, processing and distribution

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(Morgan *et al*., 2007; Watts & Goodman, 1997) have further synchronised the nature, extent, intensity, velocity, and impacts (Held *et al*., 1999) of rural landscape change.

However, despite the cross-cutting dynamics that affect rural landscapes, current research on rural landscape change tends to fall into three broad areas of investigation, which each correspond with different public policy discourses concerning rural landscapes: 1) analysis of landscape character, both cultural and biophysical, and its implications for landscape planning and protection (Fry *et al*., 2009; Pedroli *et al*., 2007; Wascher, 2005); 2) analysis of agricultural structural change and its socio-economic and landscape ecological consequences (Brouwer *et al*., 2008; Evans *et al*., 2002; Ilbery & Bowler, 1998); and 3) critique of urbanisation and counter-urbanisation processes and their implications for rural–urban relationships and periurban landscapes (Antrop, 2004; Busck *et al*., 2006; European Environment Agency, 2006; Wilson, 2007). These different perspectives reflect contrasting disciplinary traditions and different public policy orientations, and are largely discrete realms of academic and policy discourse. However, in order to understand and better manage rural landscape change in the context of global trade and sustainability imperatives, and in order to implement landscape specific imperatives such as the European Landscape Convention, it is necessary to analyse and interpret the landscape effects of structural change in agriculture and urbanisation *in combination*.

This paper therefore asks the question: how are the complex dynamics at the intersection of agricultural structural change and urbanisation expressed within European rural landscapes? The analysis is undertaken at two scales: first at the local scale, with a focus on the agents who manage change, and second at the wider regional scale, focused on key indicators of change. At the local scale, agricultural landscapes are produced, maintained and changed by farmers as the primary agent, and we analyse how different types of farmers are affecting two contrasting Danish landscapes. We use the actions of full-time farmers as indicators of commercial imperatives for structural change, and hobby farmers as indicators of counter-urbanisation (Primdahl, 1999; Primdahl & Kristensen, 2011). In order to supplement this agent-focused analysis with a more general, structural investigation we also present a study of 168 Western and Southern European regions in which we focus on patterns of intensive agriculture (and intensification) seen in relation to simple indicators of agricultural conditions and the degree of urbanisation. The approach is exploratory (rather than hypothesis testing), and combines both inductive and deductive elements of analysis (Overmars *et al*., 2007) in order to analyse the intersecting dynamics at two spatial scales. Implications for developing an integrated policy approach to the management of landscape change are then briefly discussed.

Changing Agricultural Landscapes: Key Concepts and Analytical Framework

This section introduces concepts that underpin the investigation, and outlines two complementary frameworks of analysis. One focuses upon the conditions of agricultural production and their relationship with urbanisation (Figure 1), the other on public policy and the farmer as a landscape manager (Figure 2).

Basic natural conditions for agricultural production include soil, water, drainage, terrain, and climate, which establish the *suitability* of landscapes for production (Tivy,

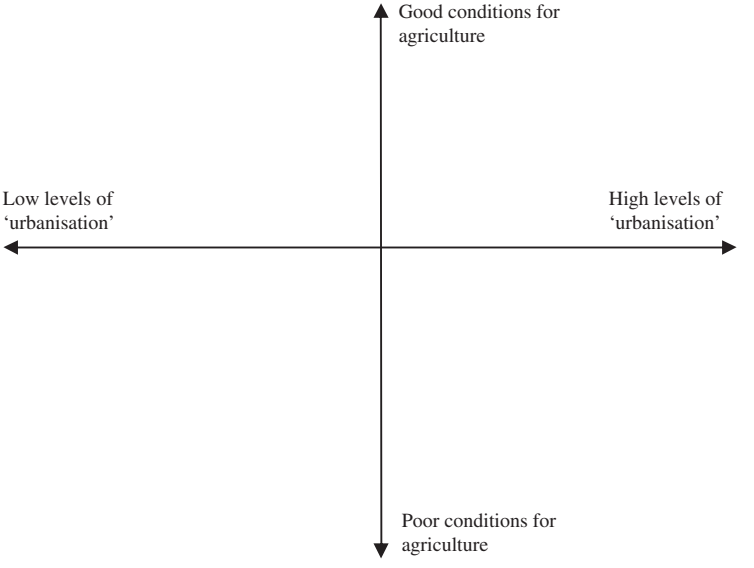

Figure 1. Two main drivers of agricultural landscapes – agriculture and urbanisation including counter urbanization and general influence of 'urban' investments and 'urban' values. (Modified from Primdahl and Swaffield 2010, p7).

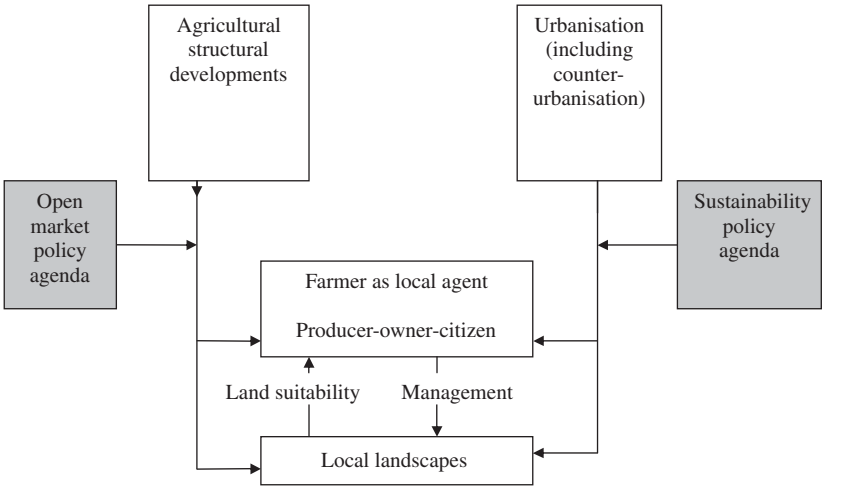

Figure 2. The two important policy agendas affecting rural landscape and the other key drivers. (Moderated from Primdahl and Swaffield 2010 with inspirations from Dwyer and Hodge 2001).

1990). Conditions vary greatly in space. Their significance may also change over time, as technological innovation changes the opportunities to produce, and thus the comparative advantage of different areas for agriculture (Munton, 1992). However, in the long term and on the large spatial scale these conditions are relatively stable (setting

aside for the moment issues of long-term climate change). Most of the regions in Europe with good conditions for agriculture currently were also considered favourable regions a century ago (Grigg, 1974).

Intensity of production is a critical variable in determining the character of agricultural landscapes. It can be analysed in several dimensions, such as labour, capital, energy, stock units, inputs and outputs. Agricultural intensification occurs where there is need or potential to increase production due to market changes and/or technological innovations. Intensification has a range of consequences, particularly upon ecosystems and biodiversity (Tilman *et al*., 2002). Extensification is the reverse process, in which inputs to agriculture are reduced, often as a response to declining prices or as part of land retirement (Brouwer *et al*., 2008). One key feature of the current phase of globalisation of agricultural systems is the intensification of particular systems in particular types of location, and the counter trend of extensification in others (Pinto-Correia, 2010; Primdahl, 2010).

Urbanisation is a complex phenomenon which historically has been closely linked to agricultural development (Rosen & Tarr, 1994). *Rural–urban migration* is a dominant driving force of urbanisation globally and remains significant even in developed countries. Urbanisation competes for rural resources, as cities offer jobs, higher wages and social opportunity (Champion, 2001). This process has been documented in many marginal regions of Europe and is a major public policy issue (Brouwer *et al*., 2008). *Counter-urbanisation* is an opposite movement of people and capital, as urban people move to the country in search of a 'rural' lifestyle (Champion, 2001; Kontuly, 1998), for retirement, as commuters, or as IT-based home workers. Counter-urbanisation has also been well documented in Europe (Fielding, 1982), and can lead to 'gentrification' of formerly agricultural settlements and increased part-time or 'hobby' farming (Busck *et al*., 2006; Primdahl, 1999). Here the challenge for landscape policy is different, but still relates to changing agricultural function and landscape patterns, combined with the effects of new development in rural settlements.

Urban expansion into formerly rural land as suburbs and new towns represents a third dimension of urbanisation (Antrop, 2004). Although the absolute land area converted to urban uses may not be large in proportion to the region as a whole, the effects can be extensive, for example through land values. Introduction of urban related functions into rural areas such as water storage, transportation infrastructure, distribution centres, high-tech factories and recreational facilities, all contribute to disorganised 'urban sprawl' (European Environment Agency, 2006).

Figure 1 illustrates possible relationships between agricultural conditions and urbanisation. The vertical axis shows conditions for agriculture as a gradient from very good (fertile, well drained soils with favourable climate and well functioning agricultural structures) to very poor (poor soils, unfavourable climate, inadequate structures or combinations of these). The second axis indicates the proximity to urban centres, ranging from urban fringe to remote rural landscapes.

The 'position' of the regions in this matrix will—to a significant extent—frame the dynamics and change forces affecting landscape. However, these relationships are not predetermined, as urbanisation and agricultural structural changes are not the only change factors of importance to agricultural landscapes. Rural communities also initiate change (van der Ploeg *et al*., 2002). Furthermore, relationships between urban and rural

areas are not geographically simple, with various dynamics typically expressed through layered networks (Murdoch, 2000).

Public Policy Agendas

The location of a region in the matrix of suitability and urbanisation and its characteristic intensity is more than a tool to compare and contrast regions. It is also an indicator of needs and relevance of various public policy interventions that provide the regulatory, incentive and 'advisory' frameworks for agricultural landscape change. Two sets of policies in particular affect rural landscapes in Europe. First, there is the Common Agricultural Policy (CAP) and other market policies related to land, food and energy. The CAP is under reform through progressive decoupling of payments to farmers from production, shifting support and incentives towards broader Rural Development Programme goals. This shift is part of the obligations of Europe towards a wider market policy promoted by the WTO framework (Potter, 2010). The CAP reform represents a liberalisation of the CAP, making European agricultural structure more open to market conditions in an increasingly globalised economy, in which a significant proportion of the farms will have difficulty in competing. Reforms have also increased agri-environmental measures, which by 2002 covered about 25% of the total farmland in EU (European Environment Agency, 2005). Cross-compliance measures attached to the new de-coupled direct payments mean that the CAP as a whole is getting greener.

The other critical policy settings affecting local rural landscapes come from the sustainability agenda (World Commission on Environment and Development, 1987). These aim at managing the environmental and landscape consequences of market dynamics, technological developments, and urbanisation. Policies include the European Landscape Convention (ELC) and EU Environmental Directives. Whereas EU directives represent the development of a strong regulatory framework at the European level, the ELC (functioning through the European Council) is focused on local landscapes as 'perceived' by people in their everyday life (Council of Europe, 2000). The ELC encourages the signatory countries to implement legislation and educational practices that raise awareness of well functioning and attractive landscapes, and involve people in policy and planning (Jones, 2007). At member state, provincial, and local levels, physical planning also belongs largely within the sustainability agenda—together with other national, regional and local environmental policies of various kinds.

Whereas market policies are determined largely at EU level, sustainability policies are designed and implemented at all levels (Primdahl & Swaffield, 2010). CAP rural development programmes and cross-compliance requirements to some degree 'bridge' between the market policy agenda and the sustainability agenda (Brouwer, 2004). However, although a clear majority of EU member states have signed the ELC there are no institutional links between ELC and EU legislation. There are unrealised opportunities to develop an innovative, efficient and integrated (economically, socially and environmentally) landscape policy domain in Europe by better connecting the CAP, EU environmental directives, and the ELC—particularly if the EU itself decides to sign the convention (Jones *et al*., 2007). Such institutional combinations could continue the long European tradition of combining territorial policies with market policies, in contrast with the more sectoral policy approach to rural landscape in many new world countries such as the US, Australia and New Zealand.

The farmer is the key local *agent* in landscape change (Kristensen *et al*., 2004). Although corporate farming and investment in agricultural land by non-farmers is increasing worldwide (Morgan *et al*., 2007; Nassauer, 2010) the European farmer remains the central figure shaping local rural landscape change. He or she functions as a landscape manager through three distinct roles: as producer, property owner and citizen (Primdahl, 2010). As a producer a farmer makes decisions concerning crop and livestock farming practices which are crucial for the ecological condition of landscape. As a property owner the farmer decides on major and longer-term changes of land use, and upon the future of non-productive landscape elements. In situations where producer and owner are different persons it is typically the owner who is legally responsible for managing change linked to 'landscape legislation' such as nature conservation, land use and planning law. Finally, the farmer is also a citizen, a member of a local community, and in this role may participate in various collective decisions relating to landscape. Figure 2 illustrates relationships between the two main policy agendas and the farmer as agent in responding to diverse drivers of change. It highlights the need to incorporate a range of considerations in interpreting landscape change at the intersection of different policy agendas and different functional drivers.

The following sections present empirical analyses framed by the two models (Figure 1 and 2), starting at the local level with a focus on the farmer as landscape manager.

Rural Landscape Changes: Current Change Patterns in Two Danish Areas

Agricultural functions, socio-economic characteristics of farmers and indicators of landscape change for two agricultural landscapes in Denmark have been analysed over the period 1995/1996–2008. The Hvorslev area is characterised by relatively good agricultural conditions (typical for eastern Denmark). Sønder Omme is dominated by sandy soils representing relatively poor conditions. Both areas are located between 30 and 50 km from urban centres. Table 1 summarises their changing functional characteristics. Key indicators include land area, land tenure (owned, leased), the type of farmer (full-time, part-time, etc.) and stock density.

The first notable feature is that the proportion of full-time farmers is declining in both cases, in line with wider structural changes in Danish agriculture that concentrate production on fewer and bigger full-time farms. However, this common trend disguises two different patterns of change. In Sønder Omme the share of land *owned* by full-time farmers declined by nearly a quarter 1995/1996–2008, whilst that owned by part-time and hobby farmers increased. In terms of ownership therefore, urban interests have become more significant. However, the area of land *leased* by full-time farmers and the number of farmers with leasehold land have both increased, indicating that part-time and hobby farmers are actually farming their own land less than in the mid-1990s. That is, on the less favoured land, a greater proportion of the land is being managed by full-time farmers, even though it may be owned by others. This may indicate an increasing scale of farming operations in order to remain viable on the poorer soils and is expressed in stock numbers: cattle density has been stable but a change has taken place from dairy production to less labour-intensive beef production. Pig density has increased, but still remains much lower than on the better soils in the Hvorslev area, and horse density has increased, reflecting the lifestyle choices of the hobby farmers.

Table 1. Development of agriculture and socio-economic characteristics of farmers in Sønder Omme and Hvorslev in the period 1995/96-2008

	Sønder Omme				Hvorslev			
	1995		2008		1996		2008	
Size of area included in the interview, ha	5102		3975		12636		11314	
Agricultural property, numbers	168		132		591		382	
Average size of the agricultural property, ha	30		30		21		30	
Land leased out, % (percentage of owned land)	19		26		16		16	
Share of farmers with land leased out, %	37		50		34		37	
Cattle density, number per 100 ha	65		67		60		32	
Pig density, number per 100 ha	72		80		572		558	
Horse density, numbers per 100 ha	2,1		4,8		4,2		4,3	
Farmers without any husbandry, %	49		59		32		56	
Farmer types (F)[a] and their share of land (L), %	F	L	F	L	F[b]	L	F[b]	L
- full-time	(35)	(42)	12	32	27	51	15	49
- part-time	(7)	(9)	11	14	3	4	6	8
- hobby	(38)	(30)	55	39	43	25	53	26
- pensioners	(17)	(14)	19	13	23	17	25	15
- others	(4)	(5)	3	3	3	3	1	2

[a]For Sønder Omme in 1995 the definition of the farmer type was based on the farmer's own perception (figures in bracket). For Hvorslev in 1996 and the 2008 survey the famer type was based on a fixed definition: Full-time = no additional income, part-time = 50% or less than 50% of income from outside farming, hobby = more than 50% of the income from outside farming. The income is only based on farmer's income, not on the household income.
[b]X^2 test for the F[b] column cells (distribution among farm types and change over time): $p < 0.001$. As the definition for farmer types in the Sdr. Omme area differ in the two years a test has not been carried out for this area.

In Hvorslev on better soils the proportion of land owned by full-time farmers has also decreased, whereas the share of land belonging to hobby farmers and part-timers has increased indicating that hobby farmers are buying more land from pensioners (and other farmers who sell) than do full-time farmers. Furthermore, the figures indicate continuing specialisation and concentration of production, with fewer farmers having livestock, a decline in the number of cattle (all types) and pigs.

The different trends in husbandry may indicate different adaptation strategies to rising land prices (driven by urbanisation) and greater price competition in agricultural commodities (from market liberalisation). On poorer soils full-time farmers respond by expanding the scale of their operations, and in so doing also provide a form of 'management service' for the hobby farmers. On better soils they may intensify production within the given area, but this area is going down, together with the overall husbandry production.

In terms of landscape change, the proportion of arable land has declined in both areas—more so on the lower suitability land in Sønder Omme. Land formerly in rotation has converted to permanent grassland, forest or just been abandoned (Table 2). It is mainly hobby and pensioner farmers who convert arable land into more extensive uses, in contrast to the full-time farmers who are intensifying. This is also expressed in other landscape changes, as full-time farmers remove more hedgerows than they are establishing. On the higher suitability land in Hvorslev, all farmer types have established more

Table 2. Landscape changes in Sønder Omme and Hvorslev in the period 1995/96-2008

Farmer type	Location	Change of land in rotation[a] (%)	Change in hedgerows		Landscape index[b]	
			Estab.	Removed	Estab.	Removed
			Ha or m change/100 ha/year			
Full-time	Hvorslev	-0.1	15	2	0.16	0.04
	Sønder Omme	0.5	51	68	0.27	0.26
Part-time	Hvorslev	-2.4	38	13	0.51	0.07
	Sønder Omme	-5.4	77	43	0.32	0.18
Hobby	Hvorslev	-6.2	70	11	1.07	0.18
	Sønder Omme	-17.2	64	27	0.94	0.30
Pensioners	Hvorslev	-6.8	8	4	1.07	0.17
	Sønder Omme	-12.6	20	22	0.38	0.22
Others	Hvorslev	0.3	0	0	0.07	0.04
	Sønder Omme	-13.3	47	108	0.68	0.61
All areas (Δ %)	Hvorslev	(-3.1) -215	30	5	0.46	0.10
Total, ha	Sønder Omme	(-8.0) -214	56	44	0.56	0.27

[a]If there has been an increase in the total amount of permanent grassland, forest and nature area, the share of land in rotation has declined and vice versa.
[b]An index reflecting the overall changes of uncultivated landscape elements (hedgerows, ponds, woodlots, permanant grasslands etc) recorded at the farm level – the higher the index, the more changes.

permanent landscape elements than they have removed, and there is also a clear tendency that hobby farmers are much more active than full-time farmers in undertaking landscape change, both by taking land out of rotation and in establishing new hedgerows (measured per land unit).

In sum, these detailed studies indicate that the rural landscape is changing as a result of *both* agricultural structural developments and urbanisation processes, *working in combination*. Full-time farmers are intensifying production on higher suitability land, and enlarging the scale of operations on lower suitability land. The process is influenced by the increasing number of hobby and part-time farmers who typically bring urban capital and incomes, and are increasingly significant as land owners, and also bring urban ideals of country living which they express through landscape enhancement and increasing numbers of horses for recreation.

Regional Change Patterns in Western European Rural Landscapes

In this section we shift the scale of analysis. Using the framework outlined in Figure 1, the intensity of agricultural production in Western and Southern Europe is analysed at a regional scale in relation to the level of urbanisation and suitability for agricultural production in each region. The analyses cover the regions of EU-15; that is, the 15 Member States of the Union before the enlargement in 2004. The regions are

administrative regions, municipalities, counties, countries, etc., in most cases the so-called level 2 in the common European Nomenclature of Units for Territorial Statistics (Eurostat, 2010). The analysis was limited to the EU-15 due to data limitations and the figures therefore reflect trends in Western Europe only and do not include the new member states in Central and Eastern Europe, where agricultural land and enterprises have been re-privatised in recent decades.

The *suitability for agriculture* in each region has been classified based on three climate variables and three soil variables: length of growing season, water deficit, days with frost, texture of soil, slope and depth of soil. They have each been given a score 0, 1, or 2, where 2 is given for conditions that favour all crops, 1 for conditions that are suitable for cereals, and 0 for areas that are only suitable for grasses or not suitable at all for arable farming. The six scores are added together, to create a total score in the range 0 to 12. At an overall classification level, all factors are thus assumed to be of equal significance. These calculations are done for so-called agri-environmental zones that are smaller than the administrative regions (see Janssen *et al*., 2009). To find a suitability score for each region the average score has been calculated by weighing the original scores by the area. Finally, the regions have been ranked, starting with the lowest suitability.

The *degree of urbanisation* of the regions has been calculated based upon the regional population density and the regions ranked. Though population density is a rough measure, and may over estimate the level of urbanisation in regions with large areas and uneven population dispersal, it was chosen as continuous values are needed for the analyses. The ranking of the regions according to population density was checked against a classification of the regions based on the method applied in the OECD typology of rurality of regions (see Terluin *et al*., 2010). Statistically significant differences were found between rural, intermediate and urban regions as defined in the OECD typology and population density. Population density thus provides a broad indicator of the relative influence of urban systems upon rural landscapes at a European level.

The *intensity of farming* is measured by the monetary value of the agricultural output per hectare, applied to all 168 regions in the EU-15 (see Andersen, 2010; Andersen *et al*., 2007). The analysis is based on 2006 data from the Farm Accountancy Data Network (FADN), which is an annual survey of commercial agricultural holding in the European Union. The sample includes approximately 80 000 farms, representing the approximately 5 000 000 farms in the Member States of the European Union. The data include information on crop and husbandry production, labour force, stocks, sales, purchases, production costs, assets, liabilities, quotas and subsidies (European Commission, 2012). For each region, the share of agricultural land managed by high intensity farms has been calculated and the regions grouped in four equally sized quartiles. 'High intensity farms' are defined as farms with an agricultural output > 3075 €/ha, a figure representing a 2006 adaption to the FADN database mentioned above (European Commission, 2012). The case studies presented above are both located within one of these regions (Denmark), which is characterised by a medium level of urbanisation (rank 82), medium to low suitability (rank 65), high intensity farming (30% of the agricultural area managed by high intensity farms), and medium intensification from 1995 to 2006 (+38%).

It is important to note that the regional analyses are focused on 'professional' farms, due to the nature of the FADN statistics. Data on hobby farms *per se* are not available at the European level. This is a clear limitation in interpreting the results, although as

noted in the previous section, there is frequently a close functional connection between the so-called hobby farms and adjoining 'professional' farms, through land being leased, or other arrangements. Notwithstanding the limitation, several features stand out: 1) the majority of European regions (64%) are characterised by a combination of *either* high agricultural suitability and high degrees of urbanisation *or* low suitability and low degrees of urbanisation (the zones in the upper right or lower left of Figure 3); 2) proportionally fewer regions have high urbanisation and low suitability (bottom right), or high suitability and low urbanisation (upper left), confirming the close historical association of urbanisation with better soils; 3) although the majority of regions lie on the urbanisation–suitability axis described above, there are regions in all four classes of intensity present across all urbanisation and suitability rankings, illustrating the wide range of combinations of regional landscape conditions; 4) most regions with a high proportion of intensive farming also have high ranking of both urbanisation and of suitability (68% of that category, see Table 3); 5) most regions with a lower share of intensive agriculture also have a low suitability and/or a low urbanisation ranking (upper left of Figure 3).

To supplement the statistical analysis presented here an analysis of change trends in terms of rates of intensification has been undertaken (see Appendix 1). Four observations can be made: 1) a majority of regions have intensified over the study period; 2) a medium level of suitability for production appears to be *a necessary precondition* for strong intensification; 3) the highest rates of intensification are also associated with higher levels of urbanisation. However, high levels of urbanisation are *not* a *necessary*

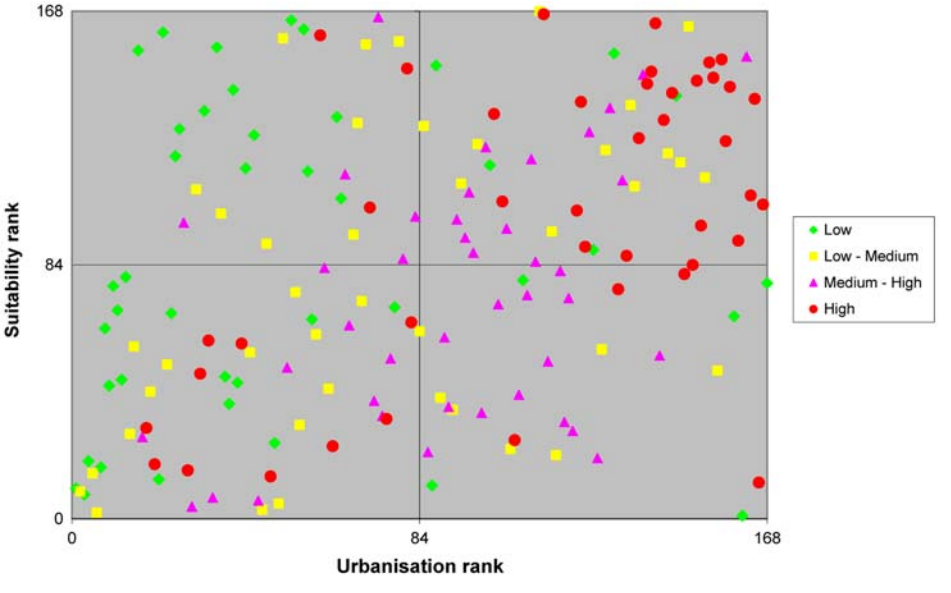

Figure 3. The European regions according to ranking of urbanisation (1 is low urbanisation) and of suitability for agriculture (1 is low suitability). The colours show the share of the agricultural area in the region managed by high intensity farms in four groups from low to high. Source: FADN/DG-AGRI-G3, SEAMLESS adaptation. (See online colour version for full interpretation).

Table 3. The share of the regions in the different groupings of intensity of agriculture combined with the different groups of ranking of urbanisation and suitability (the squares in Figure 3)

% of agricultural area in high intensity farming, by quartile	Low Urbanisation/ Low Suitability	Low Urbanisation/ High Suitability	High Urbanisation/ Low Suitability	High Urbanisation/ High Suitability	No. of regions
< 5.4	33	47	17	9	42
5.4 - 14.3	30	27	20	22	42
14.3 - 27.7	19	17	47	24	42
> 27.7	19	10	17	44	42
No. of regions = 100%	54	30	30	54	168

X^2 test: $p < 0.001$
Source: FADN/DG-AGRI-G3, SEAMLESS adaptation

precondition for strong intensification; 4) regions that experience the weakest intensification are most likely to have lower levels of urbanisation, although there are exceptions.

It is difficult to find distinct spatial patterns at a European level in the results. For example, the Italian regions are placed in all four quadrants combining urbanisation and suitability (Figure 3), in three of the four the intensity of farming classes of Table 3, and in all four intensification classes in the analyses in Appendix 1. The results for France, United Kingdom and Sweden are similar. This indicates a very diverse pattern across the territory of EU-15 regarding both the urbanisation, suitability and the intensity and change processes of farming. Further details on the results for the individual regions are presented in Appendix 2.

The absence of hobby farmers in the statistics means the data presented in Appendix 1 is likely to be distorted in regard to changes in intensity in respect to area—or total land use within the regions. Nonetheless, at a European level, changes in production intensity, and hence in rural landscape character, are clearly being driven by a *combination* of structural change (due to more open market policies and the reform of CAP), *and* various forces of urbanisation (including counter-urbanisation).

Discussion of Results

The detailed case studies showed the dynamics of structural change and urbanisation in two different types of landscape. In the area with good conditions there is a tendency for full-time farmers to concentrate and specialise as part of agricultural structural adjustments, with relatively few impacts on the landscape pattern. A counter-urbanisation process is also evident with clear landscape impacts, as hobby farmers extensify land use and establish new landscape elements such as hedgerows, ponds, wood lots, etc., to a much larger degree than full-time farmers. In the area with more marginal land there are also indications of counter-urbanisation and clear differences between the 'landscape practices' of full-time and hobby/part-time farmers. Despite the relatively poor conditions there is some indication of intensification among full-time farmers through increased stock numbers and expansion of operations on leased land

rather than with more intensive arable farming. In both areas the agricultural landscape is becoming more multifunctional, with functions related to rural living, recreation and habitat management gaining importance, as part of counter-urbanisation processes.

Exploratory analyses of change at a regional level indicate that higher levels of agricultural production intensity are most prevalent in regions with high urbanisation and high land suitability. Lower levels are associated with low urbanisation and/or low suitability. Much of this can probably be attributed to historical legacy. However, it is also notable that the highest rates of landscape *change* due to intensive agriculture are most likely to be in the regions that have both medium to high suitability for agriculture, *and* high levels of urbanisation. Conversely, change due to extensification is concentrated in regions with lower levels of urbanisation, and particularly with a combination of low urbanisation and low suitability.

As noted previously, the observations must be qualified by the use of the relatively simple indicator for urbanisation (due to lack of data on this issue at the European level). When combined with great variations in the geographical size of the regions there may be significant internal variations in regions that have the same or similar urbanisation scores, and the figures must be interpreted with this limitation in mind. Furthermore, while the statistics behind the regional analysis of changes in intensification may be representative concerning farm business activities (seen from a strict sectoral point of view), they are unlikely to fully represent developments in land use and landscape management, since hobby and part-time farmers are—from a land use point of view—heavily underrepresented, and since they are unlikely to have the same types of landscape practices as the full-time farmer. The detailed studies in Denmark clearly showed that hobby farmers and full-time farmers have very different landscape management practices. The regional analysis of intensification in production is therefore likely to be significantly distorted concerning the validity of the data in respect to land use, and the results are consequently shown as an appendix rather than in the main paper. Despite these data limitations, the analyses clearly express the importance of structural change and urbanisation working in combination as change drivers in rural landscapes.

Research and Policy Implications

There are several implications for further research. First, improved understanding of the change pressures on rural landscapes needs an analysis of the *interrelationship* between different dynamics of change (in this case, structural adjustment and urbanisation), as well as investigation of the dynamics themselves. There would be significant benefit in undertaking more systematic factorial analyses of the data presented here. Second, there is a need to investigate how these interrelationships are expressed in different *types* of region. The diversity of European regions was evident in the spread of plots on Figure 3, and analyses are needed into the different conditions expressed. Third, there is a need to improve the agricultural statistics on a European level, so hobby farmers and pensioners are not excluded (or severely underrepresented). Fourth, micro-scale analyses have been valuable to tease out the specific processes at work, and should be undertaken for cases that represent the full range of possibilities, so the limitations discussed above can be dealt with more systematically.

There are also a number of policy implications. In reviewing the intersection of the market and sustainability agendas within developed countries, Primdahl and Swaffield (2009) questioned the assumption that these agendas are necessarily compatible, and identified several different policy challenges, depending upon the type of landscape involved, expressed in terms of agricultural intensity and urbanisation. The challenges they identified resonate with the patterns and trends identified in this analysis.

First, in intensive production landscapes strongly connected to international markets, the policy challenge is to find better ways to ensure that soil, water and biodiversity resources are adequately protected against the unintended effects of intensification—or restored in case of damage to vital resources. Second, in regions with poor conditions, a key challenge is how to sustain biodiversity and other values associated with extensive farming in the face of the marginalisation and abandonment of farming practices. Hitherto, support has been provided through stewardship schemes and other rural development measures, but rising public debt levels may constrain the extent of urban support for these types of approach in the future. A challenge in this context is how to build community capacity to manage—in combination with incentives—non-productive landscapes over the longer term. Third, in intensively managed landscapes near urban centres the challenge is how to maintain the green/blue landscape infrastructure that knits the production mosaic together, in the face of development pressures, and how to manage the interface between production and urban uses. In lower intensity landscapes near urban centres, favoured for their amenity quality, the challenge becomes how to manage the interface between wealthy hobby farmers and the adjoining urban populations.

There are two common themes across these different situations. The first is the continuing role of the farmer as a local agent, and how to strengthen his/her contribution as a citizen, in the face of competing pressures upon their management and land owner roles. As a manager, the continuing pressure of price competition, declining support payments and rising energy costs will increasingly constrain the flexibility to undertake significant stewardship functions. This will be further constrained by more corporate ownership structures. As land owners, farmers also face a situation where land prices typically exceed the values justified by production. Exercising responsible citizenship in these circumstances is both challenging and necessary.

The other common theme has been the diversity of European regions in respect to the way the different dimensions of suitability, urbanisation and intensity of production intersect, as this sets a challenge for governance and policy structure. There is a need to find ways to achieve sufficient consistency across regions and countries to satisfy cross-compliance requirements of global and European level agreements, whilst allowing sufficient flexibility to respond to the variable specifics of local landscapes, as promoted by the European Landscape Convention.

Two further imperatives need consideration. The first relates to energy and climate change, the policies for which must be designed with integration of concerns for their local landscape impacts. They may reinforce land competition and intensification—but they may also play a positive role in improving the economic conditions for ‘extensive management’, when shrubs, grasses and other ‘natural’ biomass can be used in the so-called second generation production of biofuels.

The final imperative relates back to the opening paragraph of the paper. The implementation of landscape focused public policy imperatives such as the ELC has

provided major impetus for development of improved systems of landscape inventory, characterisation and monitoring, and promoted greater integration of ecological and cultural dimensions and indicators. The analysis of trends across European regions has highlighted the dynamism of rural landscapes under the twin imperatives of structural adjustment and urbanisation, and these dynamics are likely to be strengthened in the future. Hence tensions are likely to increase between, on the one hand, the desire for continuity of landscape identity in the rural hinterlands of the city regions across Europe (as expressed in the ELC), and on the other hand, the instability of all landscapes in the face of structural change and urbanisation. Combining top-down approaches with bottom-up community approaches becomes the primary policy challenge.

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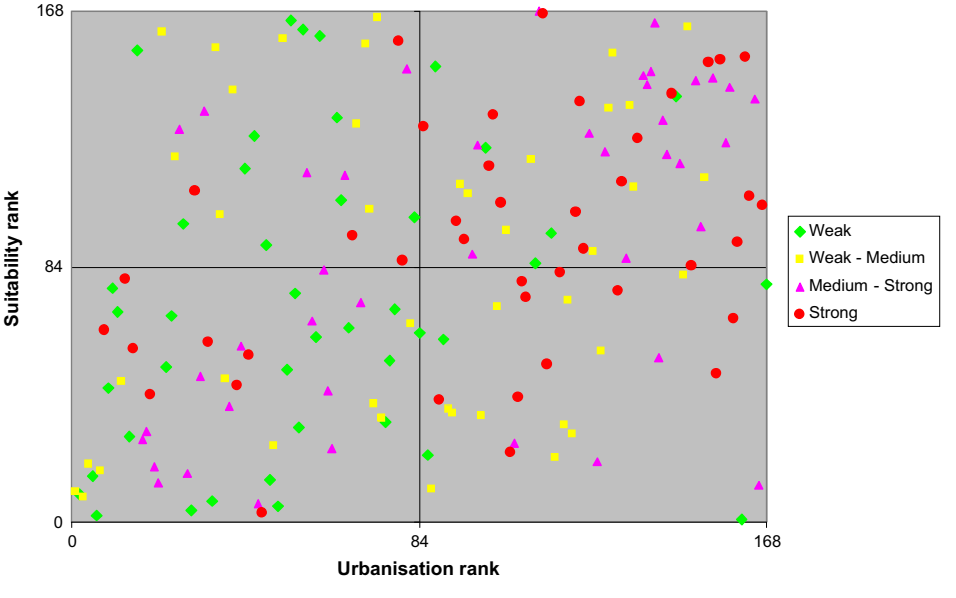
Appendix

Appendix 1. Analysis of the intensification of agriculture in EU-15 regions from 1995 to 2006

To supplement the state analysis presented in the main text of the paper an analysis of the change in terms of intensification has been carried out. For the change analysis 'intensification' has been calculated as the change in the average value of agricultural output per hectare for each region from 1995 to 2006 (adjusted for price changes). The regions were then grouped in four equally sized groups according to the degree of intensification from weak to strong. The results are presented in Appendix Figure 1 and Appendix Table 1.



Appendix Figure 1. The European regions according to ranking of urbanisation (1 is low urbanisation) and of suitability for agriculture (1 is low suitability). The colours show the change in intensity of farming in four groups from weak to strong.
Source: FADN/DG-AGRI-G3, SEAMLESS adaptation.

Appendix Table 1.The share of the regions in the different groupings of change in intensity of agriculture 1995 to 2006 combined with the different groups of ranking of urbanisation and suitability (the squares in Appendix Figure 1).

Change in intensity of farming in %, by quartile	Low urbanisation/ low suitability	Low urbanisation/ high suitability	High urbanisation/ low suitability	High urbanisation/ high suitability	No. of regions
Weak (Change – 40 – 27.4)	41	37	13	9	42
Weak – Medium (27.4 – 42)	19	33	37	20	42
Medium – Strong (42 – 59)	26	17	13	35	42
Strong intensification (>59)	15	13	37	35	42
No. of regions = 100%	54	30	30	54	168

Source: FADN/DG-AGRI-G3, SEAMLESS adaptation
X^2 test: $p < 0.001$.

Appendix 2. Specification of regions ranking and results

Appendix Table 2. Regions: Urbanisation rank, suitability rank, % of agricultural area managed by high intensity farms and intensification % from 1995 to 2006 in mentioned order

Ovre Norrland: 1; 10; 2; 29	Niederosterreich: 55; 31; 10; 22	Braunschweig: 111; 119; 14; 35
Pohjois-Suomi: 2; 9; 7; 27	Southern and Eastern: 56; 162; 3; 12	Puglia: 112; 85; 23; -22
Mellersta Norrland: 3; 8; 0; 29	Centro (P): 57; 115; 5; 49	South West: 113; 168; 14; 59
Ita-Suomi: 4; 19; 3; 38	Brandenburg: 58; 66; 1; 56	Zeeland: 114; 167; 73; 66
Norra Mellansverige: 5; 15; 8; 27	Andalucia: 59; 61; 8; 12	Cataluna: 115; 52; 17; 321
Aaland: 6; 2; 9; 27	Galicia: 60; 160; 30; -20	Alsace: 116; 95; 12; -5
Lansi-Suomi: 7; 17; 4; 34	Languedoc-Roussillon: 61; 83; 21; 44	Sachsen: 117; 21; 7; 29
Castilla-La Mancha: 8; 63; 2; 69	Sydsverige: 62; 43; 8; 53	Freiburg: 118; 82; 23; 59
Smaaland med oarna: 9; 44; 5; 27	Ionia Nisia: 63; 24; 29; 42	Mittelfranken: 119; 32; 17; 41
Alentejo: 10; 77; 2; -2	Picardie: 64; 133; 2; 10	Hannover: 120; 73; 15; 35
Extremadura: 11; 69; 1; -10	Lorraine: 65; 106; 0; 7	Oberbayern: 121; 29; 16; 41
Aragon: 12; 46; 4; 35	Principado de Asturias: 66; 114; 27; 46	Groningen: 122; 102; 61; 66
Castilla y Leon: 13; 80; 2; 105	Kentriki Makedonia: 67; 64; 21; -13	Flevoland: 123; 138; 76; 66
Dytiki Makedonia: 14; 28; 14; -13	Cantabria: 68; 94; 12; 95	Veneto: 124; 90; 34; 108
Corse: 15; 57; 7; 923	Trier: 69; 131; 10; 40	Prov. Liege: 125; 128; 28; 54
Border, Midland and Western: 16; 155; 1; 12	Umbria: 70; 72; 13; 52	East Midlands: 126; 89; 3; 29
Sterea Ellada: 17; 27; 26; 54	Pays de la Loire: 71; 157; 9; 31	Stockholm: 127; 20; 15; 53
Ipeiros: 18; 30; 36; 42	Luneburg: 72; 103; 29; 35	East Of England: 128; 56; 6; 29
Valle dAosta/Vallee dAoste: 19; 42; 7; 233	Oberpfalz: 73; 39; 19; 41	Pais Vasco: 129; 122; 7; 45

(*Continued*)

Appendix (*Continued*)

Peloponnisos: 20; 18; 32; 42	Bretagne: 74; 166; 22; 40	Rheinhessen-Pfalz: 130; 136; 15; 40
	Niederbayern: 75; 34; 16; 41	
Ostra Mellansverige: 21; 13; 4; 53	Region de Murcia: 76; 33; 28; -40	North East: 131; 154; 2; 40
Limousin: 22; 161; 0; 33	Oberosterreich: 77; 53; 20; 22	Liguria: 132; 76; 43; 63
Anatoliki Makedonia, Thraki: 23; 51; 13; -13	Sachsen-Anhalt: 78; 70; 1; 23	Lazio: 133; 112; 25; 193
Auvergne: 24; 68; 1; -4	Northern Ireland: 79; 158; 7; 65	Detmold: 134; 87; 34; 51
Bourgogne: 25; 120; 0; 40	Abruzzo: 80; 86; 24; 68	Nord - Pas-de-Calais: 135; 137; 13; 39
Champagne-Ardenne: 26; 129; 2; 52	Prov. Namur: 81; 149; 36; 54	Yorkshire and Humber: 136; 110; 6; 40
Thessalia: 27; 98; 22; -26	Danmark: 82; 65; 30; 38	Overijssel: 137; 126; 80; 66
Voreio Aigaio: 28; 16; 58; 54	Calabria: 83; 100; 27; 18	Prov. Brabant Wallon: 138; 147; 27; 54
Tirol: 29; 4; 15; 22	Rhone-Alpes: 84; 62; 7; -11	Prov. Limburg (B): 139; 144; 33; 54
Notio Aigaio: 31; 48; 52; 54	Vorarlberg: 86; 22; 25; 22	Prov. West-Vlaanderen: 141; 164; 36; 54
Prov. Luxembourg (B): 32; 135; 4; 54	Thuringen: 87; 11; 5; 31	Stuttgart: 142; 54; 15; 59
Comunidad Foral de Navarra: 30; 109; 7; 253	Wales: 85; 130; 5; 92	Prov. Hainaut: 140; 148; 33; 54
La Rioja: 33; 59; 32; 156	Haute-Normandie: 88; 150; 2; 27	Munster: 143; 132; 37; 51
Karnten: 34; 7; 21; 22	Kassel: 89; 40; 6; 61	Karlsruhe: 144; 121; 12; 59
Midi-Pyrenees: 35; 156; 4; 28	Provence-Alpes-Cote dAzur: 90; 60; 23; 27	Gelderland: 145; 141; 88; 66
Basilicata: 36; 101; 10; 36	Oberfranken: 91; 37; 15; 41	Saarland: 146; 140; 1; 17
Vastsverige: 37; 47; 1; 27	Unterfranken: 92; 36; 10; 41	West Midlands: 147; 118; 10; 59
Etela-Suomi: 38; 38; 3; 48	Toscana: 93; 99; 17; 92	Lombardia: 148; 81; 47; 33
Centre: 39; 142; 1; 30	Marche: 94; 111; 7; 35	South East: 149; 163; 9; 29
Scotland: 40; 45; 0; 112	Friuli-Venezia Giulia: 95; 93; 26; 80	Campania: 150; 84; 35; 404
Dytiki Ellada: 41; 58; 37; 42	Weser-Ems: 96; 108; 24; 35	Prov. Oost-Vlaanderen: 151; 145; 44; 54
Poitou-Charentes: 42; 116; 5; 15	Piemonte: 97; 88; 21; 42	Arnsberg: 152; 97; 33; 51
Sardegna: 43; 55; 10; 146	Norte: 98; 124; 7; 49	North West: 153; 113; 14; 40
Franche-Comte: 44; 127; 1; 22	Schwaben: 99; 35; 25; 41	Noord-Brabant: 154; 151; 79; 66
Kriti: 45; 6; 22; 54	Schleswig-Holstein: 100; 123; 15; 25	Prov. Vlaams-Brabant: 155; 146; 29; 54
Bolzano/Bozen/Trento: 46; 3; 8; 105	Luxembourg (Grand-Duche): 101; 117; 4; 74	Darmstadt: 156; 49; 8; 61
Molise: 47; 91; 9; -22	Drenthe: 102; 134; 79; 66	Limburg (NL): 157; 152; 76; 66
Steiermark: 48; 14; 29; 22	Koblenz: 103; 71; 15; 40	Koln: 158; 125; 38; 51
Mecklenburg-Vorpommern: 49; 25; 3; 37	Friesland: 104; 105; 73; 66	Prov. Antwerpen: 159; 143; 32; 54
Salzburg: 50; 5; 8; 22	Emilia-Romagna: 105; 96; 28; 30	Comunidad de Madrid: 160; 67; 1; 678
Aquitaine: 51; 159; 13; 28	Illes Balears: 106; 23; 11; 67	Utrecht: 161; 92; 56; 66
Burgenland: 52; 50; 18; 22	Comunidad Valenciana: 107; 26; 33; 48	Ile de France: 162; 1; 2; 3

(*Continued*)

Appendix (*Continued*)

Basse-Normandie: 53; 165; 5; 14	Sicilia: 108; 41; 20; 69	Lisboa e Vale do Tejo: 163; 153; 17; 180
Algarve: 54; 75; 5; -2	Giessen: 109; 79; 2; 61	Noord-Holland: 164; 107; 76; 66
	Tubingen: 110; 74; 17; 59	Dusseldorf: 165; 139; 32; 51
		Attiki: 166; 12; 59; 54
		Zuid-Holland: 167; 104; 61; 66