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Peri-urban agriculture and multifunctionality: urban influence, farm adaptation behaviour and development perspectives

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“That city is more fully sufficient which the surrounding country supplies with all its vital needs than is another which must obtain these supplies by trade.”

(St Thomas Aquinas, De Regimine Principum, 13th century)

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List of Publications

The following literature review and four research papers present the basis of this cumulative dissertation. They are referred to in the text in Roman numerals. At the time of the thesis' submission two of them have been already published, two are in press and one more is within the process of review.

- I Zasada, I. (2011). Multifunctional peri-urban agriculture – A Review of societal demands and the provision of goods and services by farming. *Land Use Policy* **28**(4): 639-648.

- II Zasada, I., Loibl, W., Köstl, M. and Piorr, A. (in press). Agriculture under urban influence: A spatial analysis of farming systems and land-use in European Rural-Urban-Regions. *European Countryside*.

- III Zasada, I., Fertner, C., Piorr, A. and Nielsen, T.A.S. (2011). Peri-urbanisation and multifunctional adaptation of agriculture around Copenhagen. *Geografisk Tidsskrift–Danish Journal of Geography* **111**(1): 59-72.

- IV Zasada, I., Berges, R., Hilgendorf, J. and Piorr, A. (in press). Horse-keeping and the peri-urban development in the Berlin Metropolitan Region. *Journal of Land Use Science*. DOI:10.1080/1747423X.2011.628706.

- V Zasada, I. (2011). Peri-urban Adaptation Strategies of Horticultural Farms in the Berlin Metropolitan Area. *Cahiers Thématiques* **11** 'Agriculture métropolitaine /Métropole agricole': 131-140.

My contributions to the research papers contained in this doctoral thesis were as following:

- I Sole author
- II Development of the conceptual idea and analytical framework; Substantial contribution to data processing and statistical analysis (the spatial modelling has been carried out by co-authors); Predominant contribution to result discussion and the writing process.
- III Collaborative development of the conceptual idea and analytical framework with the co-authors; Contribution to the data processing, statistical analysis of the farming data (the peri-urbanisation modelling has been carried out by the co-authors); Contribution to the discussion and conclusion, as well as to the writing process in collaboration with the co-authors.
- IV Main conceptual work; Contribution to the questionnaire survey preparation (the survey has been carried out by a co-author); Predominant contribution to the writing process of results, discussion and conclusion.
- V Main conceptual work; Contribution to the interview guideline and participation in the interviews; Predominant contribution to the writing process of results, discussion and conclusion.
Erratum: The Journal has mistakenly indicated a sole authorship. Additional authors of the article are Berges, R., Hinterstoisser, P. and Piorr, A.

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List of Abbreviations

ARL	Akademie für Raumforschung und Landesplanung (Academy for Spatial Research and Planning)
BBR	Bundesamt für Bauen und Raumordnung (The Federal Institute for Research on Building and Spatial Development)
CAP	Common Agricultural Policy
CEMAT	Council of Europe Conference of Ministers Responsible for Spatial/Regional Planning
CLC	Corine Land Cover
CSA	Case Study Area
EEA	European Environment Agency
EESC	European Economic and Social Committee
ESDP	European Spatial Development Perspective
EU	European Union
FSS	Farm Structure Survey
GIS	Geographical Information System
MFA	Multifunctionality of Agriculture
NUTS	Nomenclature des unités territoriales statistiques (Nomenclature of Territorial Units for Statistics)
OECD	Organisation for Economic Co-operation and Development
ODPM	Office of the Deputy Prime Minister
PCA	Principal Component Analysis
PLUREL	Peri-urban Land-use Relationships (Integrated Research Project)

PUA	Peri-urban Agriculture
PURPLE	Peri-urban Regions Platform in Europe
RDP	Rural Development Programme
RUR	Rural-Urban-Region
SCoT	Scheme of Territorial Coherence
UBA	Umweltbundesamt (German Environment Agency)
WFD	Water Framework Directive

Summary

The analysis of the multifunctional character and development perspectives of peri-urban agriculture represents the central topic of this doctoral thesis. Peri-urban agriculture (PUA) is defined as the agricultural land-use in proximity to, and the under influence of, nearby urban areas. Distinguished from agriculture in rural areas, PUA reflects the spatial framework conditions of peri-urban areas brought about by adapting the mode of farming activity being carried out. The individual research papers shed light on PUA from different perspectives, with each focussing on its various elements which include the spatial observation of actual agricultural systems and agricultural land-use activities, the examination of framework conditions, and adaptation behaviour. This cumulative approach has enabled the application of multiple spatial-analytic and social-scientific methodologies to obtain a comprehensive picture, and in so doing has greatly improved knowledge of this research issue. To this end, the thesis examines characteristics of peri-urban farming systems on a European and regional case-study level. Differences to agriculture in remote rural areas were identified as well as the relationship to urbanisation, while valuable insights into perceptions and the strategic behaviour of individual farm holders were also obtained.

The *first paper* reviews the literature on multifunctional peri-urban areas, since it contrasts the services and functions provided by PUA with the demands and requirements of those values in the urban society. In *paper two*, farming systems of Rural-Urban Regions (RUR) in the European Union (EU) are comprehensively investigated, attempting to indentify typical features of agriculture in metropolitan and urban-centred regions and the relevance on the peri-urban extent. Similarly, but on a cross-municipal comparison using the Copenhagen metropolitan region as a case study, *the third paper* analyses the spatial occurrence of certain farming structures and activities in relationship to different types of peri-urbanisation, distance to the urban core and other spatial determinants. Based on the results of the previous articles, *papers four* and *five* focus on two farming activities which

typically prevail in peri-urban areas – horticulture and horse-keeping. Applying questionnaire survey and purposeful in-depth interviews in the metropolitan region of Berlin-Brandenburg, perceived urban pressures and opportunities and the adaptation behaviour of farmers are investigated and distinguished for different types of farming.

Key findings indicate that the agricultural land-use in the peri-urban contributes to the quality of life in urban regions, as it fulfils broad ranges of functions and services to the nearby urban areas. This includes food production as well as the provision of recreational services and other services related to the management of the cultural landscape, which in turn contribute to the ecological capacity of the landscape. It has been found that PUA distinguishes itself by the prevalence of two elements – an intensified, high-value production on the one hand, and extensified, lifestyle and environmental-driven land-use on the other. High-income revenues, small-scale farm structures and the parallelism of horticulture and grassland cultivation represent typical characteristics. From the perspective of farm-holders, the opportunities attached to the peri-urban framework conditions outweigh the disadvantages, which have encouraged them to adopt activities that valorise the urban demand potential. Finally, when reflecting on the planning and policy requirements for the development of PUA, the main fields of action are the preservation of farmland and encouragement of multifunctional land-use, the strengthening of urban-rural relationships and the enhanced consideration and targeting of agriculture in peri-urban areas.

Zusammenfassung

Die Analyse des multifunktionalen Charakters sowie die damit verbundenen Entwicklungsperspektiven peri-urbaner Landwirtschaft stellen die zentrale Thematik der vorliegenden Dissertation dar. Peri-urbane Landwirtschaft ist dabei durch die räumliche Nähe zu städtischen Agglomerationen, sowie deren Einfluss auf die agrarische Landnutzung gekennzeichnet. Vor allem bestehen Unterschiede zur Landwirtschaft in stärker ländlichen Räumen insofern, als das die, durch die räumliche Lage im direkten Stadtumland bedingten Rahmenbedingungen Anpassungsprozesse hinsichtlich der Art und Weise der landwirtschaftlichen Nutzung nach sich ziehen. In diesem Zusammenhang wird im Rahmen der, zur Dissertationsschrift gehörigen, wissenschaftlichen Aufsätze das Phänomen peri-urbaner Landwirtschaft aus unterschiedlichen Blickwinkeln betrachtet. Der kumulative Ansatz ermöglicht dabei eine interdisziplinäre Herangehensweise, welche räumlich-analytische mit sozialwissenschaftlicher Untersuchungsmethoden miteinander verbindet, um einer umfassenderen Betrachtung des Themas gerecht zu werden. Zum einen steht die räumliche Analyse bestehender Betriebsstrukturen und landwirtschaftlicher Bodennutzung in Metropolräumen und peri-urbanen Gebieten im Vordergrund. Zum anderen soll die individuelle Wahrnehmung peri-urbaner Rahmenbedingungen durch Landwirte, sowie deren strategisches Anpassungsverhalten im Hinblick auf die Bedeutung für eine multifunktionale ländliche Entwicklung untersucht werden.

Anhand der Gegenüberstellung von Forschungsbeiträgen zu Funktionen und Leistungen stadtnaher Landwirtschaft einerseits sowie der gesellschaftlichen Nachfrage und den Anforderungen an diese andererseits, gibt der *erste Aufsatz* einen Überblick über den Stand des aktuellen wissenschaftlichen Diskurses zum Thema multifunktionaler peri-urbaner Landwirtschaft. Mit dem Ziel typische Merkmale der Landwirtschaft in verstärkten und Metropolregionen zu identifizieren, werden im *zweiten Beitrag* Agrarstrukturen in Stadt-Umland Regionen (Rural-Urban Regions) innerhalb der Europäischen Union (EU) untersucht. Neben der Regionsklassifizierung fällt hierbei auch

der regionalen Verteilung spezifisch peri-urbaner Räume im Zusammenhang mit dem Auftreten bestimmter Landnutzungsstrukturen eine wesentliche Rolle zu. Der *dritte Forschungsartikel* hat die Analyse des räumlichen Verteilungsgefüges verschiedener Betriebs- und Anbaustrukturen im Spannungsfeld sozio-ökonomischer Entwicklungen in Stadtumlandgemeinden der Metropolregion Kopenhagen zum Thema. Hierbei ist vor allem die Frage von Interesse, inwiefern die peri-urbane Landwirtschaft im Ergebnis eines auf den städtischen Bedarf ausgerichteten Anpassungsprozesses multifunktionale Charakteristika aufweist. Basierend auf vorherigen Ergebnissen, wird in den *Aufsätzen vier* und *fünf* mit dem Gartenbau und der Pferdehaltung jeweils eine spezifische landwirtschaftliche Nutzung näher betrachtet, die eine besondere peri-urbane Relevanz aufweist. Begrenzt auf den engeren Verflechtungsraum der deutschen Metropolregion Berlin-Brandenburg werden auf der Basis von Fragenbogenuntersuchungen und Tiefeninterviews Erkenntnisse dazu gewonnen, inwiefern sich Stärken und Potenziale sowie Schwächen und Hemmnisse des peri-urbanen Standortes für die landwirtschaftliche Nutzung aus Betriebsinhabersicht darstellen. Einen Erklärungsbeitrag zu Unterschieden in der Betrachtungsweise, sowie zu dem damit im Zusammenhang stehenden Anpassungsverhalten soll dabei die Unterscheidung nach Betriebstypen leisten.

Die Kernergebnisse legen nahe, dass die landwirtschaftliche Nutzung im peri-urbanen Raum in einem wichtigen Umfang zur Lebensqualität in Stadtregionen beiträgt, indem es einen breiten Umfang an Funktionen und Leistungen erfüllt, die von der Gesellschaft nachgefragt werden. Dazu zählen neben der Versorgung mit frischen und hochwertigen Lebensmitteln vor allem das Angebot an Dienstleistungen im sozialen und Freizeitbereich, die Pflege und Erhaltung der Kulturlandschaft sowie die damit verbundene Bereitstellung von ökologischen Funktionen. Hinsichtlich des Anpassungsverhaltens stadtnaher landwirtschaftlicher Betriebe können im Wesentlichen zwei gegensätzliche strategische Richtungen unterschieden werden. Einerseits finden sich Intensivierungstendenzen als Reaktion sich verknappender Anbauflächen. Andererseits zeigen sich vielfach extensive, umwelt- und freizeitorientierte Ansätze landwirtschaftlicher Nutzung. Abhängig von regionalen Gegebenheiten steht dabei oftmals ein kleinteiliger, einkommensintensiver Gartenbau einer extensiven Grünlandwirtschaft gegenüber. Grundsätzlich scheint im Gegensatz zum herkömmlichen Paradigma der marginalisierten stadtnahen Landwirtschaft unter den Inhabern landwirtschaftlicher Betriebe die Wertschätzung von Standortvorteilen, bedingt durch die Nähe zu städtischen Räumen,

durchzusetzen. Neben der Tatsache, dass Vorteile, wie Konsumentennähe und infrastrukturelle Erschließung stärker wahrgenommen werden als Nachteile, wie Bodenpreise oder Einschränkungen der landwirtschaftlichen Aktivität, zeigt sich, dass diese bereits zu einem Anpassungsverhalten in dem die Orientierung auf den städtischen Markt zu Ausdruck kommt, geführt haben.

Abschließend werden die vorliegenden Forschungsergebnisse im Hinblick auf die regulativen Eingriffsmöglichkeiten zwischen räumlicher Planung, Regionalentwicklung bis hin zum Agrarförderinstrumentarium diskutiert. Dabei steht das Ziel im Vordergrund, die bestehenden Ansätze und Entwicklungspotenziale – Anpassungsfähigkeit, Ausrichtung auf städtische Märkte, Diversifizierung – hinsichtlich der Etablierung und Stärkung einer multifunktionalen, peri-urbanen Landwirtschaft nutzbar zu machen, die den vielfältigen ökologischen, ökonomischen und sozialen Anforderungen städtischer Räume gerecht wird.

1 Introduction

1.1 Research Background

The rapid urbanisation process in the European Union (EU), as well as in other parts of the world, has brought about the emergence, spatial expansion and dynamic transformation of peri-urban areas – a zone around cities and urban agglomerations that stretches into the rural hinterlands. There it transforms rural societies and economies while also changing landscapes and the ecological capacities of regions. The process has therefore increasingly drawn the attention of researchers, planners and decision-makers at various administrative levels (Piorr et al. 2011, Nilsson et al. 2012). Despite its declining economic role in most cases, agriculture continually represents the main peri-urban land-use activity. Due to the extensive area currently under farm management, its value as a multifunctional open space is being increasingly recognised (CES 2004, PURPLE 2007, COM 2010). Fuelled by post-productive, consumption-oriented and demographic transitions of Western societies, and paired with a growing insecurity and awareness of resource use, each of the following has become equally relevant to the quality of life in urban areas: health and environment, the local and regional provision of food, outdoor recreation, hospitality and care. This is due to the fact that the peri-urban landscape represents an asset that is rich with amenities and acts in an ecologically balancing manner (Bergstrom 2005). This specific multifunctional role of PUA has particularly grown in political importance. In an initiative opinion, for example, the European Economic and Social Committee (EESC) (CES 2004) stated: *“that the environmental, social and economic role played by agricultural areas is more important in peri-urban areas than elsewhere.”* The platform of European peri-urban regions PURPLE (2007: 1) adds that: *“agriculture also still plays a major part [in peri-urban areas], on the one hand representing highly modern and efficient sectors producing for world markets, while other sectors fulfil a crucial role in maintaining the landscape and offering products and services for the nearby city population.”* This resonated within the public debate for

the design of the post-2013 Common Agricultural Policy (CAP) of the European Commission (2010), where the necessity of an enhanced policy targeting PUA was called for.

However, the emphasised multifunctional value is to some degree driven by assumptions and expectations rather than profound scientific knowledge. Comprehensive empirical evidence is rare or insufficient to substantiate this perspective of a multifunctional peri-urban agriculture. Research results are often sector-focussed or solely of regional significance. In an effort to create a more comprehensive picture of PUA, this dissertation thesis aims to deliver an empirical investigation of farm adaptation behaviour and activities within the scope of farming carried out in peri-urban areas and urban-centred regions. Evidence based on regional cross-cutting analyses related to the types and diversity of agricultural activities is provided. Insights into farmer's perceptions of the peri-urban framework conditions, including their strengths and weaknesses, are also identified. The way in which farm holders conceive their economic environment is important to the extent that these perceptions help shape decision-making behaviour which helps enable farming activities to better deal with the opportunities and limitations affecting PUA. This is desirable, since sustainable development of rural areas requires the identification of regulatory and supportive pre-conditions in order to handle the multiple demands for functions and values of agriculture, as well as to exploit its multifunctional potential. An inter-disciplinary research approach has been chosen to empirically analyse PUA from a social science as well as a geography and land-use science perspective within a common framework. The application of the different methodologies and spatial scales is mirrored by the different elements of the cumulative structure of the dissertation.

1.2 Hypotheses and Research Objectives

This dissertation project aims to comprehensively build upon the existing knowledge of the role of the multifunctional model of agriculture in peri-urban areas from a land-use and farming-community perspective. Different methodologies, spatial contexts and scales of analysis are therefore consciously taken into consideration within the five research papers. To ensure a coherent structure, four common research objectives were

formulated in advance to function as a guideline throughout the scientific examination. These research objectives are based upon the following hypotheses:

(i) The proximity to urban areas as loci of the increasing urban demand for multiple functions and services involving regional quality food, natural amenities, leisure and recreation represent important incentives for peri-urban farmers to carry out new activities beyond commodity production.

(ii) Peri-urban farmers are aware of the prevailing beneficial and constraining urban framework conditions, and therefore follow farm-type specific multifunctional adaptation strategies including deepening, broadening and re-grounding trajectories.

(iii) At a countryside level, the diversity of peri-urban farm types as well as their strategies, activities and functions, represents important requirements for a multifunctional development.

Based on the formulated hypotheses, the five original research papers of this dissertation thesis take up the notion of multifunctional rural development to analyse farm-based transition strategies in peri-urban areas. They aim to investigate the degree to which these strategies are implemented in peri-urban areas. The specific research objectives are as follows:

Objective 1: Literature-based assessment of urban demand and peri-urban provision of multiple functions and services provided by agriculture.

Objective 2: Analysis of the specific structure and activities of agriculture in peri-urban areas and urban-centred regions and the spatial relationship between (peri-) urbanisation and farming.

Objective 3: Analysis of urban pressures and opportunities perceived by peri-urban farmers and their multifunctional adaptation behaviour with particular reference to different farming types.

Objective 4: Identification of development perspectives of PUA and discussion of corresponding requirements for a regional planning and governance framework, as well as a rural development policy with regards to agriculture.

1.3 Structure and Organisation

The structure and organisation reflects the thesis' research objectives as well as the multiple-method approach of the empirical research. Figure 1 provides an overview of the structure of the thesis. It commences with a comprehensive literature review carried out in paper I to provide an overview and juxtaposition of the multiple functions and services demanded by the urban public and provided by peri-urban agriculture in order to unlock and delineate the research field.

Based on the findings of the literature review, the empirical work is conducted using two different methodological approaches – the spatial analysis of agricultural activities and farming systems (Paper II & III), and the examination of farm households (Paper IV & V). A spatial analysis of Rural-Urban Regions (RUR) on a pan-European level (Paper II) examines the differences and similarities of the agricultural sector in rural, urban and metropolitan regions in order to acquire knowledge related to the linkage between urbanisation and the characteristics of farming. Looking more precisely at the metropolitan region of Copenhagen, Denmark, paper III investigates the intra-regional pattern of the agricultural sector, including farming types, farm structure and activities evident as a result of adaptation to different peri-urbanisation processes.

The spatial evidence is complemented by farm household analyses in the metropolitan region of Berlin. Focussing on two farming activities typical for PUA – horse-keeping (Paper IV) and horticulture (Paper V) – the perceptions of farmers regarding the prevailing urban-related framework conditions and the corresponding adaption strategies between *deepening*, the further specialisation and intensification of agricultural production, as well as *broadening*, the diversification of farming activities, are examined in terms of how different farmers regard them.

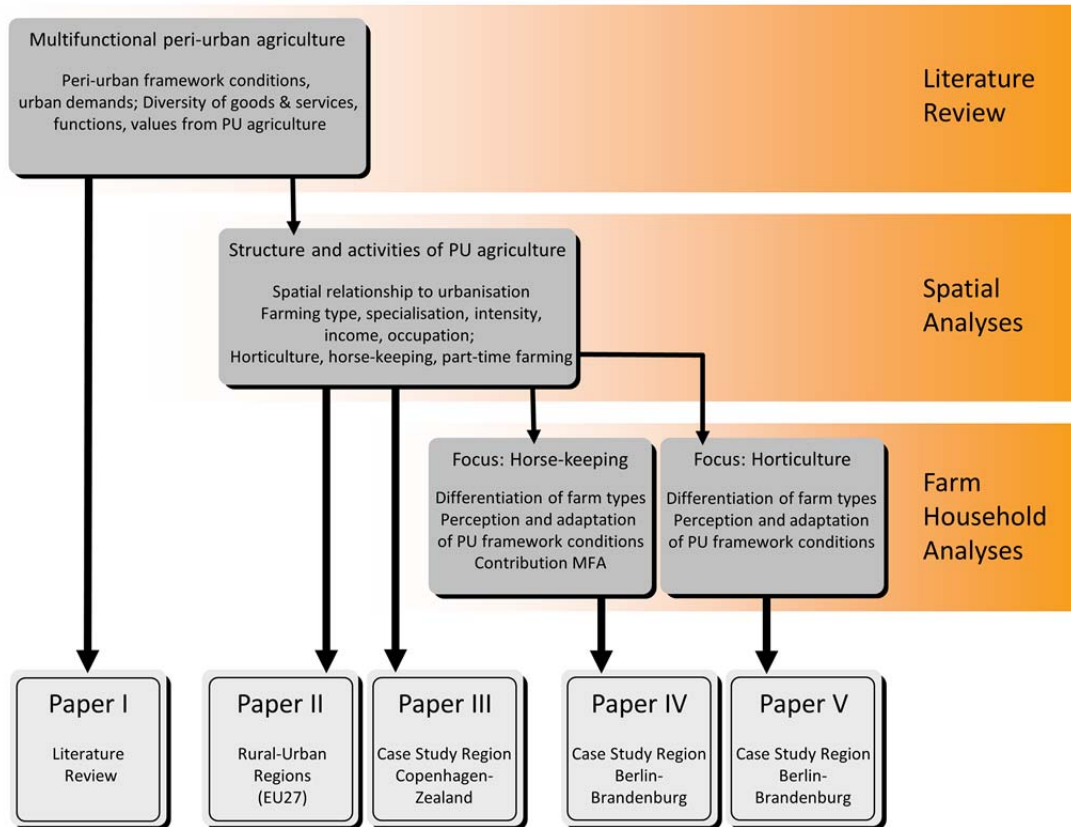


Figure 1: Structure and overview of the dissertation.

Subsequently, in the discussion chapter of this thesis, the empirical findings of the papers II-V are evaluated in light of the current state of the research debate as it is outlined in the literature review paper. The discussion results are used to identify the specific peri-urban development aspects of a multifunctional and urban-oriented agriculture. In conclusion, a design is sketched out for a regulatory framework which acknowledges the requirements of PUA in general, and more specifically its multifunctional development, from the levels of local planning and regional governance through to the European agricultural and rural development policy level.

2 State of the Art

2.1 Urbanisation and Peri-urban Areas

Over the past few decades, Western Europe, among other parts of the world, has experienced a rapid process of urbanisation beyond former city limits. This development encompasses urban sprawl – the physical conversion of open, non-built areas for settlement purposes (EEA 2006) – and socio-cultural transitions of the rural countryside, such as the adoption of urban lifestyles by the rural population, the in-migration of urban dwellers and retirees, or changes in business structures. Addressing the negative externalities (basically on agriculture) the dynamic character of the land-use change process at the *urban fringe* has been highlighted by early commentators. So have Wehrwein (1942) and Pryor (1968) similarly defined urban fringes as zones of transition between the urban land of the central city and the rural countryside dominated by farmland. Later, the discontinuity of the spatial phenomenon was increasingly acknowledged. Models became more popular among planners, geographers and agronomists. These models were based on the spatial distinction of concentric zones around cities with differing intensity of urban infiltration (Russwurm 1977, Bryant 1984). The four zone model as shown in figure 2, dividing regional cities into the inner urban fringe, outer urban fringe, urban shadow and rural hinterland, was particularly well recognised (Bryant et al. 1982).

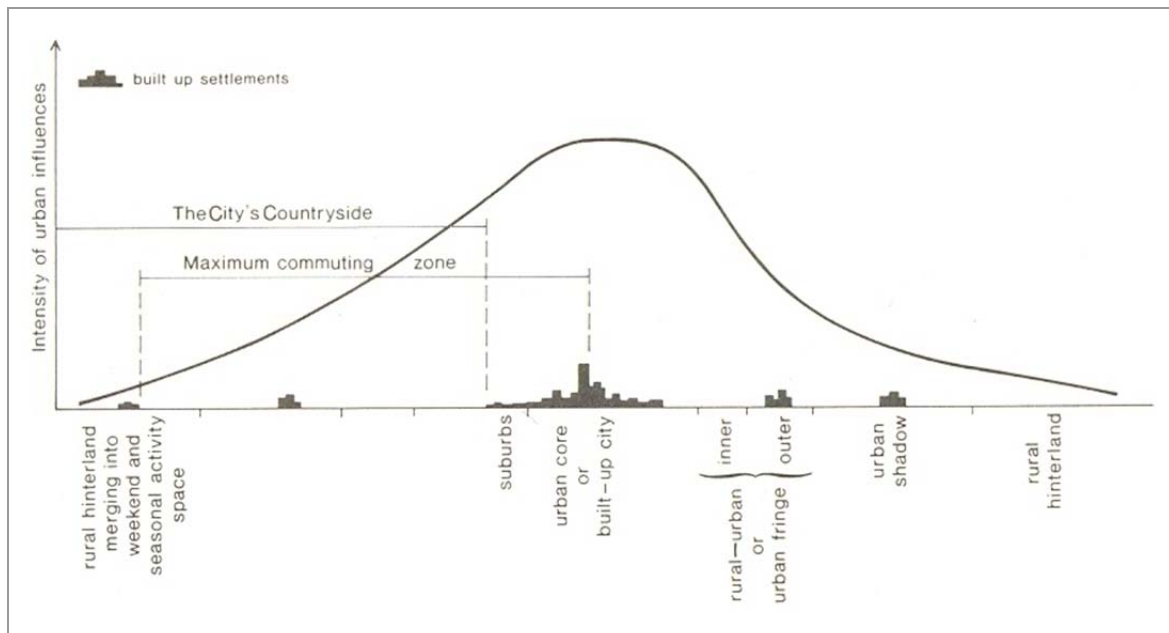


Figure 2: The form of the regional city. Source: Bryant and Johnston (1992).

Bridging the Urban-Rural Dichotomy

Although continually discussed from either an urban (Bontje & Burdack 2005, Couch et al. 2007) or rural perspective (Antrop 2000, Shoard 2002, The Countryside Agency 2004, Dewaelheyns & Gulinck 2008), there are visible attempts in present academic discourse to overcome the urban-rural dichotomy. Perception of the urban fringes has shifted with the increasing spatial integration of settlement and open landscapes. There is an increasing awareness of a common spatial entity that is characterised by a heterogeneous mix of land-use types, comprised of urban and rural elements but differentiated from pronounced urban and rural areas. Sieverts' (2003) *Zwischenstadt*, Gulincks (2004) neo-rural areas or Meeus' and Gulincks (2008) semi-urban areas are typical examples for these models.

Urban-rural Interface

When first introduced by the OECD (1979: 10), the authors directly formulated difficulties with the definition and delimitation of the term 'peri-urban area' as it "*cannot be easily defined or delimited through unambiguous criteria*". Also later, the notion of peri-urban areas continually suffered from a certain fuzziness and the lack of a widely acknowledged definition due to a parallelism of the different approaches and models, as Meeus and Gulinck (2008) concluded in their review on the debate on urbanisation. A further perception of peri-urban areas includes its role as an interface between the urban and rural sphere. Due to the high degree of spatial intertwining and interpenetration of urban and rural elements in the peri-urban, it also represents the contact zone between both. A number of scholars and research reports have highlighted the importance of peri-urban areas, placed in the background of cities in the Western world and being functionally alienated from their rural hinterlands, for their association with the reconnection of functional and social urban-rural relationships and partnerships (Allen 2003, Esparcia & Buciega 2005, ESPON 2005, Buciega et al. 2009).

Holistic Perspectives on peri-urban areas

Attempting to integrate the different aspects of location, land-use dynamism and their role as interface between urban and rural areas, the Council of Europe (CEMAT 2007: 19 f.) defined peri-urban areas as: "*areas that are in some form of transition from strictly rural to urban. These areas often form the immediate urban-rural interface and may eventually evolve into being fully urban. Peri-urban areas are places where people are key components: they are lived-in environments. The majority of peri-urban areas are on the fringe of established urban areas, but they may also be clusters of residential development within rural landscapes. Peri-urban areas are most frequently an output of the process of suburbanisation or urban sprawl*".

The synthesis report of the European research project PLUREL (Peri-urban land-use relationships) went a step forward insofar as it more comprehensively integrated the landscape aspect, and also addressed regulatory and governmental challenges. The researchers here defined the peri-urban as: "*the area between urban settlement areas and their rural hinterland. Larger peri-urban areas can include towns and villages within an urban agglomeration. Such areas are often fast changing, with complex patterns of land use and landscape fragmented between local and regional boundaries.*" (Pierr et al. 2011: 10)

Spatial Determination and Delineation

The constant progression of empirical-driven theoretisation and perception lead to a stronger acknowledgment of the peri-urban as a spatial category of its own. Being determined by characteristics related to the type and structure of land-use, the process of its transition, the adjacency to cities and metropolitan areas as well as aspects of public intervention and decision making, the peri-urban eludes a generally accepted one-to-one definition that is universally applicable in every territorial context. Due to this broadness and fuzziness of definition, numerous empirical approaches exist in the EU but also in countries like the UK, France and Germany to classify regions (BBR 2005, ESPON 2005, OECD 2007, EUROSTAT 2010) and delineate areas (Le Jeannic 1997, COM 2004, ODPM 2006) within an urban-rural continuum. An overview is compiled in (Zasada et al. in press). Those approaches are based on either population density, settlement morphology or commuting pattern.

Whereas regional typologies only indirectly address the notion of peri-urban areas by determining population numbers and density in combination with the urban structure of the entire region, spatially explicit approaches interpret peri-urban areas as zones which belong to a delineated functional city-region, but are not part of the urban core. Depending on the definitions of various empirical analyses, peri-urban areas encompass substantial amounts of the territory of European countries. Gallent (2006) and Cavailhes et al. (2004) estimated that peri-urban areas cover 20% of the territory in both Britain and France. Another approach shows that other countries like the Netherlands, Germany or Belgium consist of even higher shares of peri-urban areas, albeit with large differences in terms of population density within the peri-urban exits (cf. Figures 3). This is based on the land-use and population density carried out in the PLUREL project (Loibl & Köstl 2008, Zasada et al. in press). The phenomenon is much less present in Scandinavian and Eastern European countries where the degree of urbanisation in general is limited and concentrated on fewer urban agglomerations (cf. Figure 4).

As far as the analysis on the European level is concerned (Paper II), the comprehension of *peri-urban areas* in this dissertation follows the definition of peri-urban delineation developed in the PLUREL project. For the regional case studies, the spatially continuous delineation had to be extended to cover administrative entities or politically defined mutual influence spheres, which are more relevant to the peri-urban area.

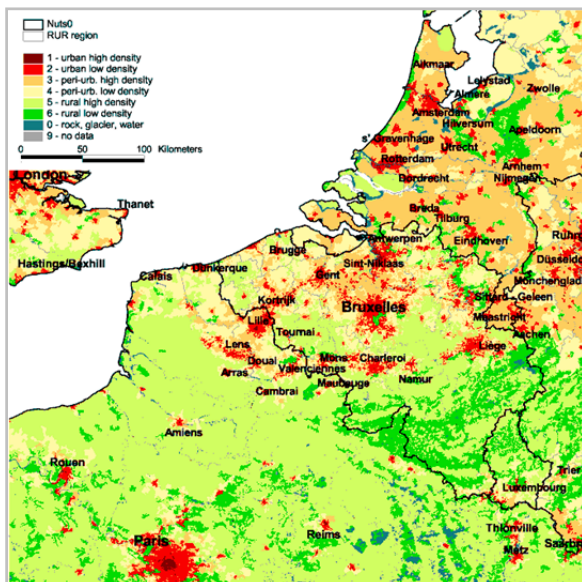


Figure 3: Delineation of urban, peri-urban, rural areas (detail from the European map: Southern parts of the Netherlands, Belgium, Luxembourg, and north-eastern France). Source: Paper II.

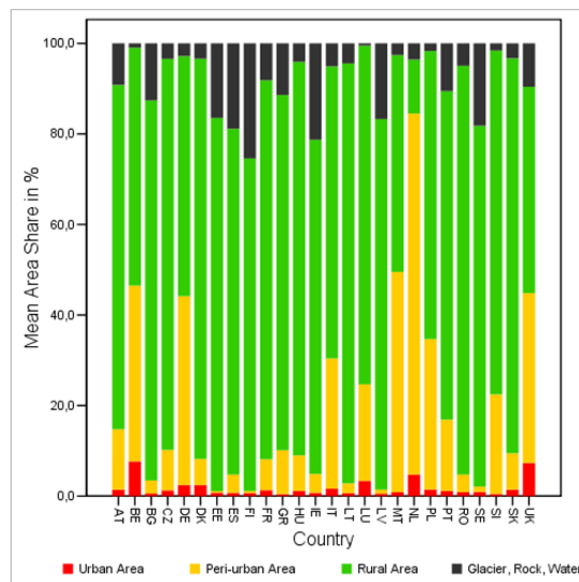


Figure 4: Share of urban, peri-urban and rural areas per country within the EU (no data available for Cyprus). Source: (Zasada et al. in press).

2.2 Agriculture in Peri-urban Areas

A large and continually increasing territorial share of peri-urban areas is used for urban purposes. It is a place for living and working, as the definition by the Council of Europe (CEMAT 2007) emphasises, as well as for downstream functions, such as infrastructure, commercial and leisure. However, natural open spaces, forests and farmland remain substantial if not the predominant elements of the peri-urban countryside. But while a broad range of planning instruments and political regulations are available for the preservation of natural resources (especially in high nature value areas) such as forests via the European NATURA 2000 and Water Framework Directive (WFD) or nature protection that individual sites have adopted, much less preservation is existent for farmland in general, which lacks similar instruments of protection. Therefore, the ongoing process of land conversion is almost entirely carried out at the expense of agricultural area. Nevertheless, many peri-urban areas are continually dominated by agricultural land-use.

Historic Role

Agriculture in peri-urban areas cannot be seen as detached from the spatial context in which it occurs. Even for its genesis and development, the inter-linkage with urban centres plays a crucial role. On the one hand, cities historically required fertile farmland in their hinterland to feed the (growing) population, particularly at a time when transportation technology was far from sophisticated. As early human settlement depended on regional food-supply, the quantity of the land resource base and soil quality represented a major determining factor for the growth of cities. It is therefore not entirely coincidental that the first cities were founded throughout the fertile flood plains of the Euphrates, Tigris, Nile and Indus (Benevolo 1986).

On the other hand, with their concentration of population, cities provided important markets for agricultural goods. Cultivation adjacent to market provided decisive comparable advantages, particularly for products with high transportation costs or which were fresh and easily perishable. For a long time, the phenomenon was important enough for the economist Heinrich von Thunen in the mid-19th century to base his classical model of agricultural land rents and corresponding land-use distribution entirely on the location to the (urban) market, neglecting all other factors such as physical geography or administrative boundaries. Depending on the variation of transportation costs, he assumed varying bid rent curves for different agricultural goods, which he then used to delineate concentric circles as production area based on optimum distance ranges from the central city (Hall 1966).

Decline and Re-discovery

The advent of the industrialisation age and its far-reaching innovations in relation to rail, road, shipping transportation, as well as those linked to advanced storage technologies for agricultural produce, all meant that 'distance' successively lost its determining character, since the costs and time of transportation were tremendously reduced. Nowadays, despite rising fuel prices, a food product's place of origin has only a marginal influence on its price for the overwhelming proportion of typical dietary consumption in the Western world. Over the past few decades, at least in the context of food supply, the traditional rural-urban relationships have been eroded and instead replaced by an inter-regional or even global form of flow and exchange.

The perception of peri-urban agriculture has gradually changed in the political and academic world. In 1979, when the OECD first addressed the topic of PUA by a broad research project including extensive regional observations, the impression was that it faced a pressured situation. While the authors' definition of PUA as a "*farming activity undertaken in the peri-urban areas, i.e. in the periphery of urban agglomerations where economic and social activities are directly affected by the presence and the expansion of the city*" (OECD 1979: 9) can be considered as a rather neutral or euphemistic reflection, they did not hesitate to reinforce their critical view by saying that "*peri-urban agriculture may also be defined as 'agriculture adversely affected (in terms of costs, land taken out of the farm, marketing, environmental conditions, uncertainty etc.) by the presence and the expansion of urbanisation'.*" (OECD 1979: 10) During the 1960s and 1970s, this sort of perception was also shared by other commentators such as Harris & Allee (1964), Krueger (1978) and Berry (1978) in North America as well as Mattern (1964) and Rettig (1976) in Europe, who all saw agriculture in the urban shadow under tremendous pressure and not being able to cope with the requirements of the Fordist production system.

Later, with the rise of post-Fordism in the late 1980s and 1990s, the perception of PUA became more differentiated. No longer was it viewed from a production function standpoint only, since the development of new societal demands for, and interests in PUA, as well as acknowledgement of its innovative and adaptive capability led to new opportunities being identified for farming and farmers in the urban fringes. For instance, Bryant and Johnston (1992: 195) emphasised that "*this general thrust [of non-farm development and its associated pressure] ignores the potential for positive interaction between urban development and agriculture.*" This ambiguous understanding of pressures and opportunities has been increasingly consolidated in more recent considerations about PUA and its adaptation to the near-urban environment (Heimlich & Brooks 1989, The Countryside Agency 2003, Robinson 2004, FAO 2007, Galli et al. 2010).

2.3 Urban Pressures and Opportunities for Agriculture

Urban Pressures

European agricultural land-use in general has been increasingly put under pressure – particularly since the 1990s. A combination of declining turnover as a result of falling prices for agricultural products, the introduction of production quota systems, as well as increasing input, technology and environmental costs have all combined to bring about a ‘cost-price squeeze’ of income in agriculture and rural economy (Ilbery 1991, van der Ploeg et al. 2002). More recently, even though food prices have begun to rise again and the income base of the commodity production has improved thanks to growing global demand (Piesse & Thirtle 2009) and land competition with energy crops (Harvey & Pilgrim 2011), prices have nevertheless remained much below what they were in the 1970s and 1980s (Angus et al. 2009).

Along with these non-metropolitan pressures, PUA has additionally been impeded by pressures related to urban growth. The OECD (1979) distinguished two elements of urban pressure that affect PUA. Firstly, changes in population and agricultural labour force, and, secondly, the transfer of land which causes land consumption stemming from the additional demand for housing and infrastructure. Since then, the reduction of available farmland through its conversion for urban purposes has been widely observed (Hofman 2001, UBA 2004, EEA 2006) and is assumed to continue in the future (Piorr et al. 2011). Through a less noticeable process, farms are re-dedicated for residential use or other functional and ownership changes, i.e. farm business structures (van den Vaart 1991, Primdahl 1999, Antrop 2004, Busck et al. 2008). Farming has to compete on the land market with other non-agricultural land-uses, such as housing with its higher bid rents (Robinson 2004). Sinclair (1967) has therefore already extended the Von Thunen model to integrate the growing urban demand for land to provide a more comprehensive picture of the land-use distribution in urban-centred regions.

This competition for land also has an impact on the remaining farmland, substantially increasing the costs for land resources (Cavailhes & Wavresky 2003). As the price for a piece of farmland with an associated building permit rises dramatically, there is a strong financial incentive for farmers to sell land for purposes of urban development. Farmers are encouraged either to accelerate the depletion of the land resources, to increase

the intensity of production, or to withdraw labour and disinvest (as a farming-to-quit strategy), all leading to an erosion of productive capacities of the land resources (Bryant & Johnston 1992, Robinson 2004). Land speculation is accompanied by expanding shares of non-agricultural owners and common land tenure by producers (Gant et al. 2011). Rising prices for farmland around urban agglomerations have been recognised since the 1960s in the developed world (OECD 1979). The authors of that study highlight the imperfectness and failures of the land market. They argue that along with macro-economic framework conditions, a greater number of factors contribute to the price formation, such as distance from the city, present and future use, prevalence of amenities, land-use policy and taxation. From his observations in the UK between 1996 and 2002, Munton (2009) recognised a strong urban impact on the agricultural land market. Land prices rose overproportionally for attractive and accessible land with accompanying dwellings. He notes that various market conditions in the direct urban fringe were characterised by much higher land prices, along with a fragmented and complex pattern of ownership and property rights such as short-term land renting contracts. It is traditionally suspected that the increasing degree of complexity and irregularity of the urban growth, accompanied by the perception of land shortage and a rather short-term outlook, increases the uncertainty of the land owners and the strategic decision-making processes of peri-urban farmers (Munton 1974, Berry 1978, OECD 1979). More recent studies, however, draw a more differentiated picture, such as Vandermeulen et al. (2005), who found land scarcity perception varying among farmers, and that the perception depended on factors such as the degree of land ownership or on future expansion plans.

In their conceptual framework for agricultural adaptation, Heimlich & Brooks (1989) also referred to land and labour market concerns but included problems of actual farm operation nuisance as well. The increasing proximity of housing and agriculture, as well as the growing amount of non-farming residents in the rural hinterlands of cities, result in further mutual conflicts and tensions. There are widespread complaints among farmers regarding theft and vandalism, illegal trespassing and the dumping of litter and waste by neighbouring residents (Shoard 2002, Bouraoui 2005, Qviström & Saltzman 2008). Farming is also constrained through the fragmentation of infrastructure and small farm sizes (The Countryside Agency 2003). Legal regulation issues, such as emission thresholds or the local institutional environment influenced by the new residents, additionally restrict

the viability of farming activity, and thereby reduce its profitability and margins (Verspecht et al. 2005, Diakosavvas 2008).

On the other hand, public complaints about agriculture have increased, especially in relation to livestock or intensive forms of production, which are considered responsible for continuing pollution, pesticide application, noise and odour issues (Heimlich & Anderson 2001, The Countryside Agency 2003). From an aesthetical point of view, problems have been identified that relate to an agriculture which is either extensively and poorly managed, or operates intensively with greenhouses or as a factory farm (Rogge et al. 2011). In her investigation of the rural transformation in the US, Salamon (2006) argues that the main challenges facing neighbourhoods of farmers and non-farmers is a sustaining of community sense and local vitality among members of the rural community who share differing values.

Urban Opportunities

However, opportunities for the economic activity of farming have also been recognised in research in addition to the increasingly differentiated perception of the peri-urban area as a place for the production of agricultural commodities as described above. In particular, Bryant and colleagues (1992), with their comprehensive examination of '*Agriculture in the city's countryside*', first challenged the previously mostly one-sided focus on the problems and shortcomings of PUA. They instead brought attention to the potentials of the urban-rural interaction by pointing out three main opportunities of PUA – rental of farmland from non-farming owners, the participation within the near non-farming labour market of the urban-industrial complex, and the implementation of alternative marketing strategies to exploit the proximity of the urban demand. As a part of pluriactive strategies, farm households increasingly improve their income-base by seeking employment opportunities outside agriculture (Fuller 1990, Evans & Ilbery 1993). Due to the wage differences between rural and urban economy, the peri-urban location provides some locational advantages in the context of off-farm income generation. Especially for marginal farms, this represents a reasonable and increasingly popular opportunity for survival and the continuation of farming activity on a part-time basis (Meert et al. 2005, Busck et al. 2006). Urban dwellers, which enter the agricultural business through part-time or recreational farming, might also establish and even expand to full-time farming as

Diakosavvas (2008) argues. Yet, from his point of view, the labour market provides yet another advantage, as more seasonal and part-time labour is available in peak periods.

Focussing more narrowly on food production, the exploitation of the proximity to the urban-based consumers and their demand for regional, high-value and fresh food represents a serious marketing possibility for peri-urban farmers, particularly for specialised horticultural vegetable and fruit growers (Loureiro & Hine 2002). Therefore, the integration of primary producers into local markets through short food supply chains gains political priority as an important contribution to a sustainable and less transport-intensive mode of food supply. It also enhances the self-sufficiency of cities and urban areas by increasing local food security (COM 2011). Farm-gate purchasing, box delivery systems or pick-your-own direct marketing schemes are therefore most often noticed within peri-urban areas (Péron & Geoffriau 2007, Aubry et al. 2008).

Beyond local food demand, increasing interest in a broad range of services, from leisure and accommodation to transportation, storage, construction or skilled crafts, has been found near urban centres (and with increasing frequency) by residential neighbours (Boulangier et al., 2004). These demands represent opportunities for farms in particular, not necessarily the entire rural economy, since the corresponding economic activities often require extensive area or storage capacity which farm holdings provide (Sharpley & Vass 2006, Præsthholm & Kristensen 2007). The production of recreational values has especially gained importance with the rise of the post-Fordist society. With growing standards of living and extended leisure time, urbanites now have more time and resources for outdoor recreation in the near countryside. Due to the proximity of urban centres as nuclei of societal and lifestyle transitions, this process provides an opportunity to restructure farming beyond the industrial model that is based on pure commodity production (Bergstrom 2005).

Although hardly researched, a third aspect refers to intrinsic comparative advantages of agriculture in the hinterland of urban and metropolitan areas. In contemporary farming, a shift has been recognised from the purely land-based advantages, such as soil fertility, to innovation and knowledge as other forms of resources (Bryant et al. 1992). Due to the higher density and diversity of the farming community and the proximity to non-farming land-use actors, it is argued that the increasing regional exchange of knowledge and information results in an increase in innovation spill-over effects, as well as

an improved mutual learning process between the actors in the food chain process (production, processing, marketing), in turn bringing about an improved competitiveness of the regional farming system (Wilson 1996, Beauchesne & Bryant 1999). Contact with urban lifestyles and ex-urban populations, as well as proximity to the urban-industrial complex as the main loci of innovation, have both been regarded as comparative advantages for peri-urban farmers to gain access to information and adopt new production techniques and products (Le Grand & van Meekeren 2008). Other scholars have shown the role of young and well-educated farmers, running intensive and specialised farms, as well as the prevalence of hobby-farmers and new-comers as ‘test-balloons’, who belong to a group of early adopters of new ideas, technologies and activities, as they are less reliant on economic profitability than regular farmers (Præstholm et al. 2007).

In summary, the framework conditions and post-Fordist driving forces of PUA are well recognised. As the general perception of its viability has changed, a corresponding shift in the evaluation of its pressures and opportunities has also taken place. Thirty years ago, the authors of the OECD study commented on the farming conditions, in that they were “*frequently more difficult there [in peri-urban areas, author’s note] than elsewhere: the breaking up of structures due to urban encroachment and the disamenities and pollution caused by the town outweigh the advantages to the producers of the proximity of consumers. But the biggest problem is the uncertainty due to the advance of urbanic uses when farm management needs a long-term view.*” (OECD 1979: 6) Even nowadays, the EESC (CES 2004) considers PUA “*areas affected by specific handicaps*” and “*whose survival is seriously threatened*”. However, there is a wide-spread acknowledgment of the opportunities and strengths peri-urban areas provide for the agricultural activity carried out, so that “*to consider peri-urban regions merely as areas under urban pressure would not do justice to the vital role peri-urban areas play as interfaces between the urban and the rural world.*” as Diakosavvas (2008: 24) states. This dissertation also follows this more differentiated view of farming activity carried out in peri-urban areas, and aims to identify the multifunctional development potentials that the areas have at their disposal.

2.4 Multifunctional Development of peri-urban Agriculture

Rural Change and Farm Adaption

Driven by output-related subsidies and the previously mentioned cost-price squeeze, European agriculture in the second half of the 20th century has been constantly under pressure to adjust production to substitute labour by capital investments under a Fordist production paradigm of economies of scale, which in turn triggers falling prices. This *technological treadmill* (Dexter 1977) gave way to a transition process characterised by the modernisation and industrialisation of the agricultural sector, and led to a strong intensification, concentration and specialisation of the production process. As a consequence of economies of scale, farms became fewer and larger, the level of inputs and investments (such as machinery, fertilisers, pesticides and the dependency of agri-input industry) increased, with the result that agricultural labour is now more specialised (Bowler 1985, Ilbery 1991).

Later, from the 1980s onwards, societal trends, like growing hedonism, consumerism and leisure-orientation, as well as increasing environmental consciousness accompanied by the rise of green politics, all brought forward a perception of the countryside as a place for nature conservation, outdoor recreation, vacation and personal enjoyment, whereas modern agriculture, amplified by the frequency of food scandals, was seen as harmful to nature, landscape and humans (Thomas 1996, Wandel & Bugge 1997, Clouth 1998). These driving forces were associated with a comprehensive *commodification of the countryside*, where farm holdings, natural amenities or landscape elements suitable for leisure activities were transformed into purchasable goods demanded foremost by an urban clientele (Cloke & Goodwin 1992, Urry 1995). In contrast to the intensive farming regions with their large spaces of production, these are, in the post-productive countryside, replaced by *spaces of consumption*, as Marsden (1999) termed the growing relevance of non-productive activities such as ex-urban living, lifestyle farming and the delivery of non-commodities like landscape management and nature conservation (Brandt & Vejre 2004, Luttik & van der Ploeg 2004, Bergstrom 2005, Piorr et al. 2007).

Consequently, farm holders have adopted survival strategies to adjust their activities and income sources to these new urban demands. Activities have shifted from quantity to quality food production (Gilg & Battershill 1998, Marsden & Smith 2005, Bowen & De

Master 2011). Farmers increasingly entered pluriactivity schemes of on- and off-farm diversification, particularly outside the prime agricultural areas, although such schemes may not have been directly related to agriculture itself (Ilbery et al. 1997, Heimlich & Barnard 1997, Inwood & Sharp 2012). In contrast to the Fordist production model, post-Fordist farming is characterised by de-concentration and de-intensification processes, reflected in the persistence of small family farms and the growth of part-time and hobby farming. A growing relevance of environmental farming schemes, a differentiation of farming styles and resonating voluntary schemes of agricultural policy have also been observed as further driving forces (Ilbery & Bowler 1998, Lobley & Potter 2004).

Nevertheless, the structural and management change of agriculture is subject to large regional variability. While less prevailing in traditional arable farming regions, it has become more apparent in marginal or amenity-rich areas (Kristensen 2001, Lobley et al. 2004, Marsden & Sonnino 2008, Pfeifer et al. 2009). Clark et al. (2007) and Galli et al. (2010) have argued that this model of post-Fordist adaptation is especially relevant in urban-centred regions, since it provides niches which have little relevance to large industrial production-oriented agriculture. The intensity of this rural change is nonetheless particularly strong in those regions, as it is also the urban sphere which is the point of departure for driving forces of socio-cultural change. The new needs of the post-Fordist society find their origin within the cities and their suburban areas (Clouth 1998, Salamon 2006).

Still, the dichotomous view of a shift from a pure Fordist production-oriented paradigm to a post-Fordist consumption paradigm of agriculture has been brought into question by the argument that both development trajectories coexist spatially and temporally (Evans et al. 2002, Wilson 2007). There is a core of professional farmers who are able to adapt their business to changing market and demand conditions beyond post-productivist pathways (Lobley et al. 2004). Various empirical evidences suggest this dualism between strategies of intensification and specialisation on the one hand, as well as extensification and diversification on the other, is particularly evident in peri-urban areas (Kristensen 2001, Péron & Geoffriau 2007). Therefore, this thesis seeks to address the question concerning the heterogeneity of farms and adaptation strategies, and provides further comprehensive evidence for their prevalence in peri-urban agriculture.

Multifunctional Transition in peri-urban Agriculture

The notion of *multifunctionality* has been established as a framework for the implementation of sustainable development in agriculture and land-use (Wiggering et al. 2003). Under the assumption that agricultural land-use equally fulfils ecologic and social functions along with its economic functions, multifunctionality has been defined by the OECD (Maier & Shobayashi 2001) as a strategy to enable the *joint production of commodities and non-commodities*. These include marketable goods like food, fibre (commodities) as well as the public goods demanded by society, such as landscape management, recreation, nature conservation or hydrological balance (non-commodities), thus contributing to the development of the rural area as a whole. Wilson's (2008) later advanced the concept of *weak* and *strong multifunctionality*, where the latter is determined by high environmental sustainability, weak integration within the global market but strong local and regional embeddedness of the rural actors, local food demand and agro-food chains, high quality food production as well as diversification.

In the course of the Lisbon strategy for economic growth and jobs (2000) and the Gothenburg goals for sustainability (2001), the EU aimed at enhancing competitiveness and sustainability of agriculture and rural areas. Therefore the multifunctionality was implemented within the CAP through the Agenda 2000 reforms to decouple financial support from primary production outputs (COM 2000). Therefore, in 2001, the Rural Development Programme (RDP) was introduced as a second pillar of the CAP to adopt the European Model of Agriculture that reflects the concept of Multifunctionality of Agriculture (MFA).

For its implementation within the ongoing funding period 2007-2013, the European Council (COM 2005) has formulated a number of general objectives of the RDP for the development of rural areas at Community level to be further concretised at a programming level. Along with the competition between agriculture and forestry, rural development is also to incorporate land management and environmental aspects, as well as quality of life and the diversification of economic activities, and finally LEADER – a community-based approach to foster endogenous regional development.

Farm-level Multifunctionality

Interpreting the consequences for individual farm holdings, van der Ploeg et al. (2002) have conventionalised a framework of transition pathways from conventional farming practices to multifunctional rural development, distinguishing *deepening*, *broadening* and *re-grounding* types of farm development trajectories (cf. Figure 5). *Deepening* represents a farm-adaptation strategy that aligns agricultural activities to enhanced coherence with societal needs and expectations. According to the model of van der Ploeg et al. (2002), typical fields of activities are the establishment of short-supply chains between producers, processors and customers along the value chain, the introduction of quality production or organic farming schemes, and regional marketing. The specialisation in horticulture and intensive vegetable production traditionally represents a typical type of farming around urban areas following the Thunensian regularity.

Embarking on a strategy to diversify the income-base of the farm enterprise, *broadening* represents an adaptation trajectory to compensate decreasing revenues from traditional agriculture by strengthening integration of the rural countryside into the farm activities. It encompasses diversification as well as nature and landscape management activities to provide goods and services demanded by a society willing to pay for either directly, through the market prices, or indirectly, through compensation payments such as agri-environmental schemes (van der Ploeg et al. 2002). There are different types of diversification intrinsic and extrinsic to agriculture, including crop diversification, agri-tourism and farm accommodation (Turner & Davies 1995, Hjalager 1996), social and care services (Di Iacovo & O'Connor 2009) or the keeping of livestock for leisure purposes (Elgåker 2011). Diversification has especially been identified as a frequent farm business adjustment and survival strategy in peri-urban areas (Ilbery 1987, Ilbery 1991, Meert et al. 2005, Præstholt & Kristensen 2007). Nevertheless, the affinity to these adaptation decisions depends on several other factors, such as locational conditions (Jongeneel et al. 2008, Pfeifer et al. 2009, Lange et al. in press), institutional environment (Vandermeulen et al. 2006), and especially the farm, its household and its enterprise characteristics (Meert et al. 2005, Dalgaard et al. 2007, Maye et al. 2009, Hansson et al. 2010).

As a third mode of multifunctional farm adaption strategy, *re-grounding* focuses on cost reduction and additional income generation, which includes passive diversification such as the renting out of farm buildings (Præstholt et al. 2007) and pluriactive off-farm

employment (Evans & Ilbery 1993). Peri-urban farmers are likely to make use of this adaptation strategy due to the proximity of urban areas with all their employment opportunities in the industry and service sector, as well as rural-urban wage differences.

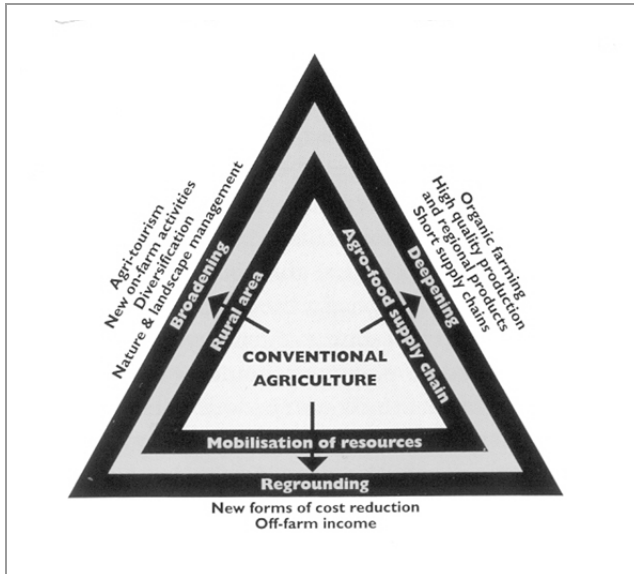


Figure 5. The structure of rural development at farm enterprise level. Source: van der Ploeg et al. (2002).

In conclusion, after reviewing the academic debate on land-use and agriculture in peri-urban areas, the perception of farming and rural economy in peri-urban settings was found to have continuously shifted from a pressured and marginalised edge of the agricultural sector, to a more comprehensive and strengthened economic domain of its own. A picture of a multifunctional, multi-actor, consumption-oriented countryside has emerged. Informed by the research on peri-urban areas, its pressures and opportunities from urban areas, external driving forces, rural change and farm transition have all created a picture of a PUA which is highly heterogeneous in terms of the types of farming, adaptation strategies and the activities carried out. Determined by this heterogeneous farming community, the peri-urban countryside as a whole meets the requirements to provide multiple functions and services for the (peri-urban) rural economy, society and

environment and landscape, from the provision of important ecosystem services, such as water and climate regulation, through to the provision of income and employment opportunities for the peri-urban communities with the associated contributions to quality of life, cultural landscape and local food security. Figure 6 provides an overview of these relationships as an analytical framework for this doctoral thesis.

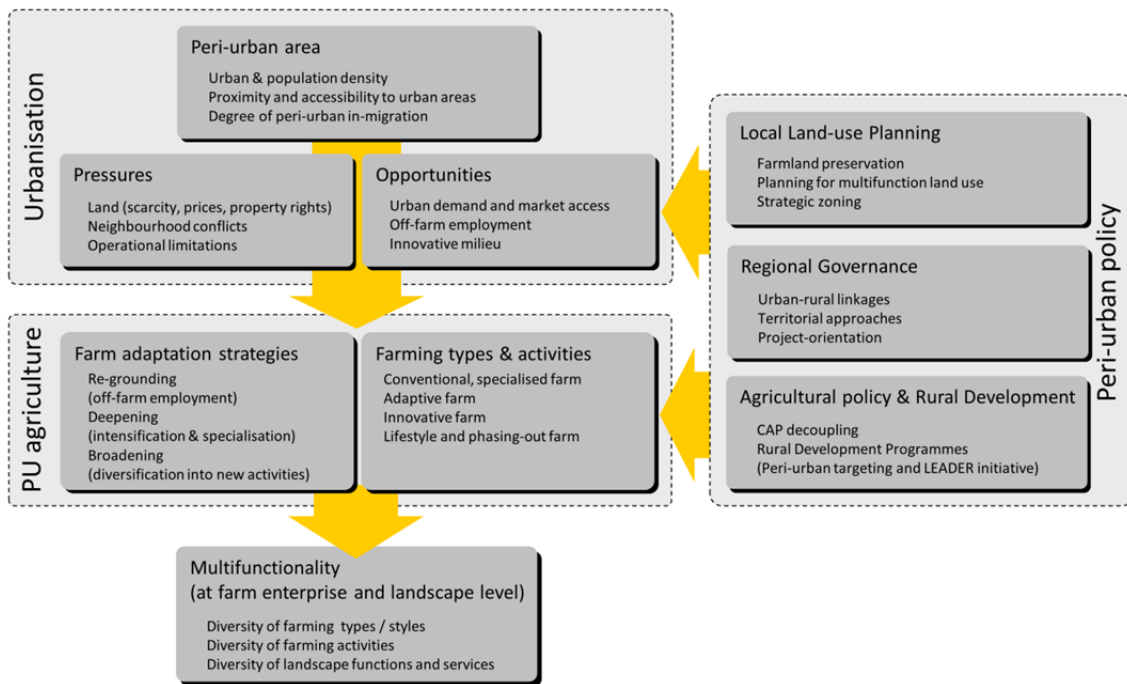


Figure 6: Analytical model of the relationship between urbanisation, agriculture and policy.

3 Methodological Considerations

3.1 Research Design

In the context of studying multifunctional agriculture and rural development, several scholars have emphasised specific methodological challenges to the topic's multi-disciplinary character and the scale-dependency of its mechanisms, processes and features (Marsden 1999, Knickel & Renting 2000, Fry 2001, Renting et al. 2009). They all call for more integrative trans-disciplinary approaches to enhance understanding of the role of agriculture for society and rural development. Marsden & Sonnino (2008), for instance, point out that pure farm-based research approaches are only capable of interpreting the multifunctional character of agriculture in relation to the notion of pluriactivity. This means that only the diversity of activities carried out on the farm is taken into consideration when attempting to comprehend multifunctionality. Instead, they add that under the post-productive paradigm, this model is replaced by a land-based approach of *landscape diversification* (p.423). In the course of the countryside's commodification, the understanding of multifunctional agriculture is shaped by the functions and values agriculture provides to nature and society. Only to a lesser extent is it shaped by the activities carried out on farm itself. This, then, requires appropriate analysis methodologies that do not only focus on the individual farm, but on larger spatial entities.

This dissertation specifically examines the multifunctional agriculture and rural development in peri-urban areas – a space of particularly intense and complex inter-relationships between farming and the neighbouring urban society. As these interactions are either significant through the spatial configuration and distribution of agricultural structure, activities and functions, or indeed through the individual farm-based activities and household decision-making processes that finally lead to them, a combination of research approaches addressing these two perspectives consequentially enhances the understanding of the evolution of a characteristic peri-urban farming community.

Within the methodology debate, this kind of methodological triangulation of qualitative interviewing and quantitative observation techniques is controversially discussed, but also acknowledged to contribute to the complementary and validation value of the research, as well as to provide new perspectives for a *theoretical saturation* (Flick 1998, Fielding & Schreier 2001). Patton (2002) argues that data from varying sources are differently sensitive to different *real-world* nuances. He points out that “*borrowing and combining distinct elements from pure or coherent methodological strategies can generate creative mixed inquiry strategies that illustrate variations on the theme of triangulation.*” (Patton 2002: 248) In terms of this thesis, farming systems at a regional or local level – entire regions or municipalities – which only represent aggregates of the farming activities of the total of individual farms, provide evidence as to whether the particular area has multifunctional characteristics or not. At the moment, multifunctionality is understood as the diversity of farming activities, functions and values (even though they are the result of farm-level decision making and development strategies). Research on multifunctionality has to be explored on a regional scale, too, however. The significance of a geographical land-based and sociological farm-based dimension for the given research objectives suggests a combination of methodologies borrowed from both perspectives. Whereas the application of qualitative and quantitative methodologies from social sciences allows insights into the individual perception of the peri-urban location and corresponding strategic decision-making processes, the spatial analyses for municipal and regional cross-comparisons place these within a wider context, and provide a more comprehensive picture of the generic pattern of peri-urban agriculture.

3.2 Land-based Approach – Spatial Analysis

In the first part of the thesis, the question of multifunctional adaptation in PUA was addressed from a geographical, land-based point of view. The individual farm has not been subject to investigation here, but instead the farming systems in defined territorial entities – municipalities and regions. Rooted in the academic discipline of agricultural geography which “*seeks to describe and explain spatial variations in agricultural activity*”, as Ilbery (1986: 1) has defined as being their main objective, spatial research approaches subsequently ought to provide an opportunity to explore and interpret distribution differences of (multifunctional) farming systems within a given territory, such as in metropolitan-centred

regions (Paper III) or even within the EU (Paper II). Therefore spatial research methodologies are frequently applied in farming and multifunctionality research (e.g. Ilbery et al. 1999, Beauchesne & Bryant 1999, Kristensen 2001, Tobias et al. 2005, Pfeifer et al., 2009). By applying quantitative empirical information about regional characteristics related to the type and the extent of peri-urbanisation of an area, such as distances to settlement cores, share of artificial surfaces, population densities, and in-migration of specific types of people across regions, regional cross-comparisons allow for the exploration and the provision of statistical indicators associated with the extent and urbanisation effects of farming, and, by implication, how and if agriculture in peri-urban areas differs significantly from remote rural areas.

The land-based approach requires extensive, regionally cross-cutting socio-economic and agricultural census data, as well as spatial land-use data, to be processed through geographical information systems. In addition, it is important to acknowledge the much larger number of non-metropolitan factors conditioning the evolution and transformation of local and regional variations within the agricultural sector independently from urbanisation and peri-urban framework conditions. These could be bio-physical conditions, the level of overall economic performance and social welfare, technological change, inter-regional competition or rural and agricultural policies (Bryant & Johnston 1992). After applying multivariate techniques to detect structures, similarities and dissimilarities in value-distribution patterns, the aim of the spatial analysis is to develop statistical models which associate independent variables of urban and non-urban factors with the dependent variables describing farming systems. Significance levels and coefficients indicate the strength and direction of the relationship between the location in peri-urban areas and the prevalence and concentration of (multifunctional) farming activities.

3.3 Farm-based Approach – Sociological Analysis

The development of agriculture and rural countryside in general depends on the activities carried out and the strategic decision-making of individuals (farmers and other actors of the rural economy and society) within the scope of natural conditions that allow a certain level of farming intensity. Studying the characteristics of farming as a result of the

adaptation response to certain driving forces – in this case urban pressures and opportunities prevalent within the peri-urban location – requires an investigation of the smallest decision making unit's individual behaviour, namely the farm household. This is particularly important, as there is a common comprehension of the existence of a large variety of farms, each distinguished by their household and business structure on the one hand and corresponding economically, along with non-economically-related decision-making motivations on the other. The authors of the OECD study (1979), as well as Bryant et al. (1992), have emphasised the variation of the socio-economic structures of the peri-urban farming community, and the differing adaptation pathways of intensification, extensification or surrendering. Referring to the prevailing framework conditions, they (p.19) have summarised that “*farmers do not necessarily respond in the same way to the same stimuli.*” However, within the increasingly post-productive, consumption-oriented countryside, economic factors are not the only relevant determinants for strategic decision making. The increasing prevalence of farm holders being motivated by lifestyle and residential factors has led some agricultural geographers such as Ilbery (1986) or Robinson (2004) to indicate that motivations which lack an economic rational are also becoming increasingly relevant to individual farm household behaviour, such as the prevailing social environment, aspirations and attitudes.

Acknowledging the heterogeneity of the peri-urban farming community, its careful consideration for the methodological approach is required. As an attempt to integrate the internal farming community differences, especially regarding their relevance for individual decision making, the notion of the farming type or farming style, differentiating farming structure and management practices (arable, mixed, livestock), economic size as well as household characteristics has been applied as the theoretical approach for research (e.g. Bowler et al. 1996, Meert et al. 2005) or statistical purposes, such as the European farm structure survey (FSS). Enhancing the understanding of the diversity within farming communities, the notion of farming styles has been advanced by the Dutch rural sociologist Jan Douwe van der Ploeg (1994, 2003, 2010). Defining farming styles, he refers to three main elements: “*[First], a farming style is a coherent set of strategic notions about the way in which farming should be practised [...]. [Second], a farming style also appears as a particular practice [...]. [Third], we can regard a farming style as a socio-technological network [of internal and external relationships].*” (van der Ploeg 1994: 111) But as the different groups of farmers share similar normative and strategic ideas of how farming should be carried out, “*a farming style provides*

a specific model for decision-making, one where the strategic notions [about the way farming should be practiced] are repeatedly shared by groups of farmers” as van der Ploeg et al. (2009: S126) point out.

The differentiation of farm types analogous to farming styles represents a central analytical element within the farm household-based research of this dissertation, as strong heterogeneity within the farming sector and consequently of adaptation strategies is expected in the peri-urban case studies. When working with typologies of (groups of) individuals and their pattern of actions and decisions, the combination of quantitative (Paper IV) and qualitative (Paper V) methods as a form of methodological triangulation has been acknowledged among sociological methodologists (Flick 1998, Patton 2002, Griesse 2005).

3.4 Case Studies, Database and Empirical Methodologies

The case study areas (CSA) and corresponding methodologies have been carefully selected according to the formulated research concept aiming at bridging geographic analytic approaches and social science methodologies. Furthermore, data requirements, such as value distributions, structure and prevailing type of data had to be taken into consideration and compared with a broader application of statistical analysis techniques. By means of secondary statistical data sources, the distribution and diversity of farming systems and activities across regions (in the EU) and municipalities (in the Copenhagen metropolitan region) are analysed under a land-based approach to multifunctional farm adaptation. Via questionnaires and in-depth interviews, insights were drawn from the farm-based research performed in the metropolitan region of Berlin-Brandenburg into the farm-household decision-making process, as well as the type and extent of multifunctional farming activities carried out in the area.

Rural-Urban-Regions (RUR)

The empirical research of the thesis starts with a cross-regional exploration of the territory of the EU. The broad comparison of RUR under specific consideration of urban and metropolitan-centred regions should provide a comprehensive overview of the regional farming systems and their regional differences. The analysis carried out in paper II pursues

the question in terms of what extent do metropolitan and densely urbanised regions systematically exhibit different farming patterns in relation to remote rural ones. Therefore, a regional clustering and classification approach was applied to differentiate RUR regions, distinguishing 128 metropolitan regions, 190 regions with large urban centres, 216 regions with small urban centres and 370 remote rural regions. Furthermore, on this European-wide basis, a spatial definition of peri-urban areas was advanced that took into consideration the proximity to settlement areas and population density. For a detailed description of the methodology, see paper II. Figure 7 indicates the distribution of the RUR regions over the EU.

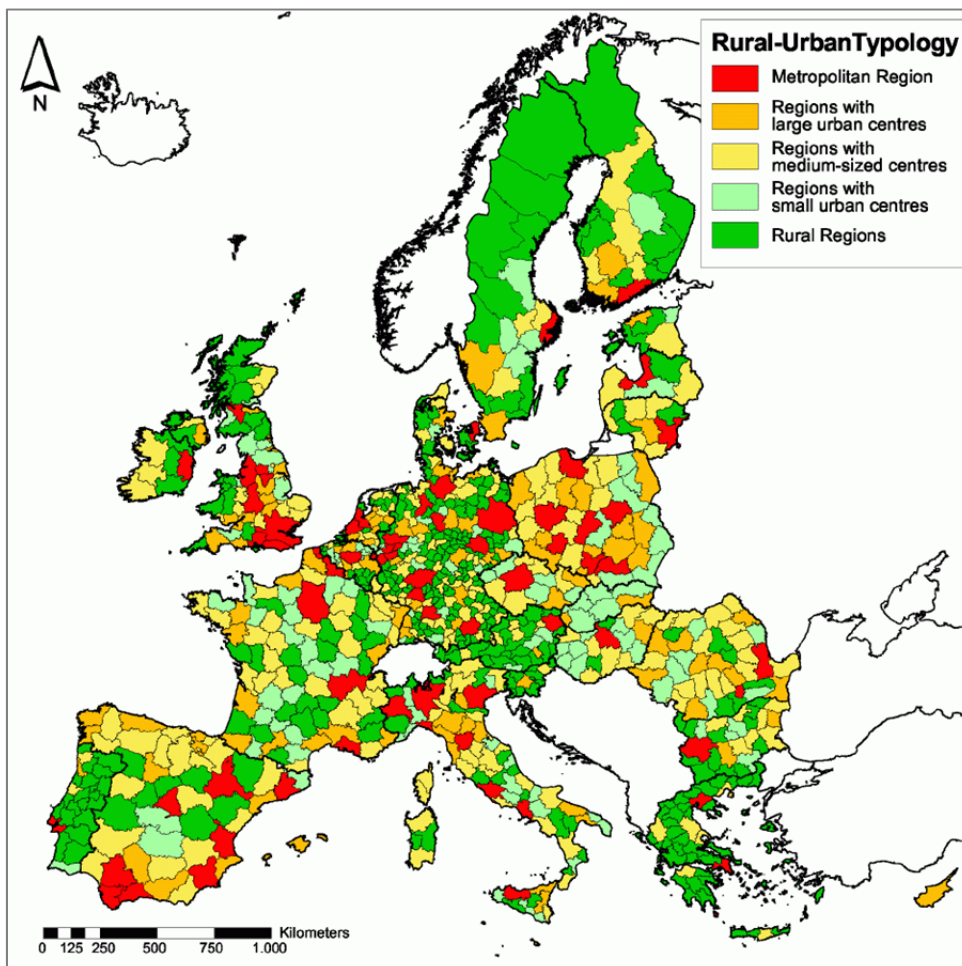


Figure 7: Rural-Urban Regions (RUR) within the EU. Source: Paper II.

For the statistical analysis, agricultural census data was obtained from the EUROSTAT regional database (EUROSTAT 2012). Spatial and temporal compliance with the urbanisation-related database was ensured by using a spatial resolution of NUTS3¹ and the census year 2000. Variable values were aggregated according to the NUTS3 clustering of RUR regions. The statistical analysis was carried out in several steps that made use of multivariate techniques. For an exploratory data analysis with Principal Component Analysis (PCA), 23 selected agricultural variables including farm holding sizes, ownership, farm income, farmers' age, occupation and specialisation were all considerably reduced to seven single factors that described the regional farming system in terms of: (i) economic size, (ii) grassland and livestock production, (iii) horticulture, (iv) land ownership, (v) arable production, (vi) family labour force and (vii) age structure. To determine the characteristics and distinctiveness of metropolitan and peri-urban agriculture, a measurement was applied concerning urban determinants in terms of their strengths of influence, such as the type of RUR region and the regional share of urban, peri-urban and rural low and high population density areas. A spatial analysis of agricultural land-use and land-use change as well as (5) uni- and bivariate statistics, which included descriptive statistics, rank-size comparisons and correlation analysis was also applied.

Based on CLC2000 data sets for the years 1990, 2000 and 2006, the extent and changes of farmland has been calculated for all 729 RUR regions for which data was available. The loss of agricultural area in favour of settlement and industrial area, other artificial surfaces as well as forest and semi-natural area has been calculated. Table 1 gives an overview of the relative changes within the different regional classifications. It indicates that agriculture in metropolitan regions especially faces continuing pressure from competing land-uses, particularly for urban purposes. Between 1990 and 2006, an average region of 4,270 ha of agricultural area was converted into artificial surface, about 1.75% of the total agricultural area in metropolitan regions – with settlements and infrastructure (2,544 ha) representing by far the largest share of the total land consumption. In this sense,

¹ NUTS is an acronym for “Nomenclature d'Unités Territoriales Statistiques” (Nomenclature of Territorial Units for Statistics). NUTS3 represents the smaller regional level, e.g. counties (Germany), départements (France) or provinces in Spain and Italy.

they differ substantially from regions that are much less urbanised and contain a lower share of peri-urban areas.

Table 1: Land-use change from Agricultural Area 1990-2006.

		Agricultural Area			
		Metropolitan Regions	Regions with large urban centre	Regions with small urban centre	Rural Regions
		(n=120)	(n=167)	(n=192)	(n=253)
Settlement & industrial area	in ha	2,544.1	1,013.1	868.5	520.0
	in %	1.09	0.61	0.57	0.51
Other artificial surface	in ha	1,725.4	565.8	499.8	251.8
	in %	0.66	0.26	0.26	0.20
Forest & semi- natural area	in ha	677.1	606.5	938.8	856.5
	in %	0.24	0.21	0.25	0.33
Wetland & water area	in ha	194.6	104.6	127.0	115.3
	in %	0.07	0.05	0.05	0.07
total	in ha	5,141.1	2,290.1	2,434.1	1,743.6
	in %	2.04	1.13	1.12	1.11

Source: Own calculations based on Corine Land Cover provided by the EEA.

Case Study Metropolitan Region Copenhagen

The metropolitan area of Copenhagen with an area of about 9,000 km² represents the first CSA (cf. Figure 8). Some 503,000 inhabitants live in Copenhagen and Frederiksberg. Næstved (76,000 residents), Roskilde (75,000 residents) and Helsingør (54,000 residents) represent other major cities in the region (Danmarks statistik 2010). The regional population has increased since the 1990s, reaching 2.32 Million in 2011. The region has seen substantial urban growth in peri-urban and rural areas, both near Copenhagen and in amenity-rich areas, such as the coastline (Herslund & Fertner, 2010).

Artificial surfaces covering settlement, industry and infrastructure have expanded by 7.2% region-wide. An analysis of CLC data for the years 1990-2006 reveals that this has basically taken place at the expense of agricultural land located close to urban areas. Agriculture, which accounts for about 70% of the total area, is particularly subject to less physical but more structural and functional changes such as transformations of farmsteads for residential and recreational purposes (Præstholt & Kristensen 2007, Busck et al. 2008).

In the CSA, the spatial inter-relationships between different peri-urbanisation processes and multifunctional farming activities are examined (Paper III). The spatial analysis is carried out for a total of 95 municipalities in the region excluding the metropolitan core of Copenhagen and Frederiksberg. The municipality level represents the most disaggregated level to depict local variances of the farming systems. Population data for each municipality has been obtained from national census data (Danmarks Statistik Statistikbanken 2010, Danmarks Statistik 1989) for the years 1986, 1996 and 2006 to depict the population change in this 20 year period. The population change has been differentiated by age, income and household size. Local farming data has been taken from statistical census data (Danmarks Statistik 2000) and was complemented by regional geo-information data on agricultural land-use (Institut for Jordbrugsproduktion og Miljø, Miljøministeriet) for the time period 1999 to 2005.

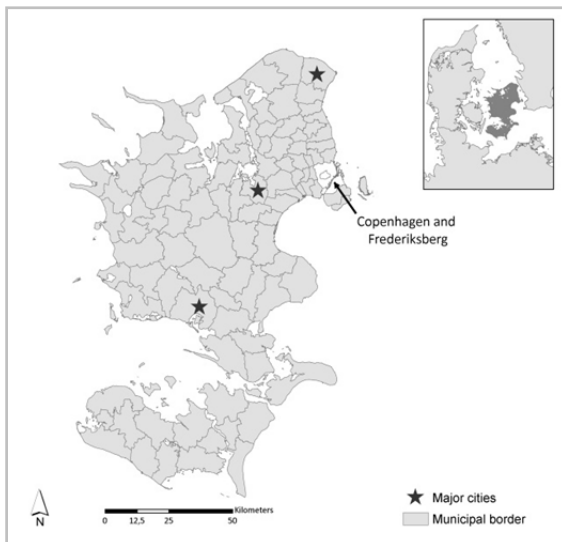


Figure 8: CSA Metropolitan Region Copenhagen. Source: Paper III.

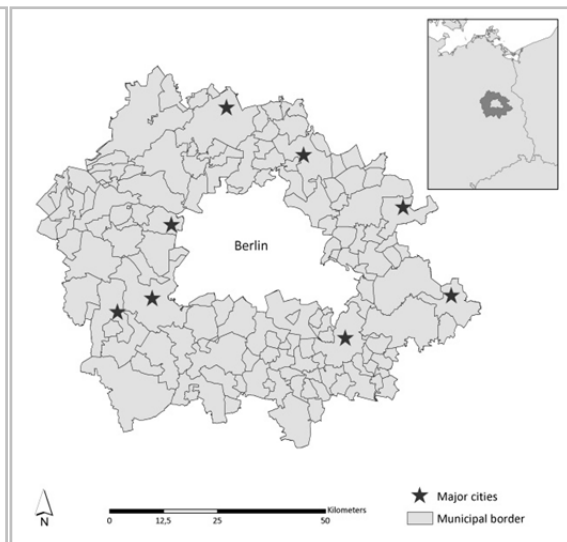


Figure 9: CSA Metropolitan Region Berlin-Brandenburg. Source: adapted from Paper IV.

Land-use Analysis

Regression models were applied to identify relevant explanatory variables to explain the spatial distribution of different farming activities providing economic production, ecological and social functions and services from the metropolitan region. The models are composed of variables covering distinct peri-urbanisation processes (*displaced-urbanisation*, *ex-urbanisation*, *anti-urbanisation* and *hidden urbanisation*), the general urbanisation degree of the municipality (population density) as well as the variables related to location (spatial distance to Copenhagen) and infrastructure (highway access). Additionally, variables representing the availability of natural and landscape amenities (coastal length, forest area, water and wetland area) as well as soil fertility (clay soils) are considered as major drivers for different types of land-use – namely agricultural (Pfeifer et al., 2009) and housing (Waltert & Schläpfer 2010).

Case Study Metropolitan Region Berlin

The second CSA is located in the German Federal State of Brandenburg and encompasses the 66 municipalities around Berlin (cf. Figure 9). As delineation, the border of the so-called *sphere of mutual influence* (engerer Verflechtungsraum) was used, which had been normatively defined by the regional planning authorities². Together with the capital city of Berlin, the CSA constitutes the core area of Berlin's metropolitan region. Some major cities, such as Potsdam (157,900 inh.), Oranienburg (42,000 inh.), Falkensee (40,800 inh.) and Bernau (36,500 inh.) are located here. The region has a size of 4,834 km² (area 2007) and is populated by about one million inhabitants, growing annually by about one percent (1996: 826,800; 2006: 1,013,500 inhabitants) (MLUR 2002, Statistik Berlin-

² Between 1998 and 2007, the *sphere of mutual influence* (MLUR 2002) was legally defined as a common planning area by the Common Regional Planning Authority (Gemeinsame Landesplanungsabteilung Berlin-Brandenburg) of the Brandenburg Ministry for Environment, Nature Protection and Spatial Development (MLUR) and the Berlin Senate Department for Urban Development, Environment and Technology (SenStadt) to implement a common regulation of urban growth, transportation as well as protection of open spaces and resources.

Brandenburg 2008). Based on data of the FSS 2007³, agriculture in the CSA is characterised by large farms of, on average, 110 ha, which is still considerably smaller than the average of 220 ha in municipalities outside the sphere of mutual influence in Brandenburg. 42.6 % of the farms are run as primary occupation with a clear domination of individual ownership at 84.5 %. The high degree of professionalisation of the farming community is underlined by a low degree of pluriactivity, with employment outside agriculture (44.6 %) considerably lower than the rest of Brandenburg (54.1 %). The prevalence of less-favoured conditions due to low yield expectations on sandy and loamy soils and extensive grassland, wetland and peat bog areas (MIL 2010) brings about a rather extensive type of land-use, as a grassland share of 33.3 % indicates.

Keeping of Horses

Horse-keeping has experienced a strong growth in the metropolitan region of Berlin-Brandenburg. Before the fall of the Berlin wall, the breeding and keeping of horses represented a marginal activity in agriculture. At that time, productivist and industrial schemes with very large, output-oriented farm co-operatives dominated the agricultural structure. It was not surprising that 84 % of the farms that participated in our survey established horse-keeping activities after 1989. Nowadays, horse-keeping is acknowledged as an important economic factor for the rural development and tourism of this region (MIL 2008). According to the FSS 2007 (Statistisches Bundesamt 2007), little more than 20,000 horses are kept on farms (horses which are privately held are not taken into consideration). The Brandenburg Ministry for Agriculture (MIL 2008) estimates that the total number of horses throughout the entire Federal State of Brandenburg was approximately 34,000 in 2007. In the CSA, at least 8,169 horses were counted on 492 farms. The spatial distribution of horses in Brandenburg (Figure 10) shows a strong concentration pattern with particularly high numbers in municipalities of the CSA in the mutual influence sphere.

³ The farm structure survey data (Agrarstrukturerhebung) for the year 2007 was provided by the Federal Statistical Office (Forschungsdatenzentrum des Statistischen Bundesamtes) on an aggregated base for municipalities. Due to data confidentiality issues, data for municipalities with less than three cases (farm holdings) were left out.

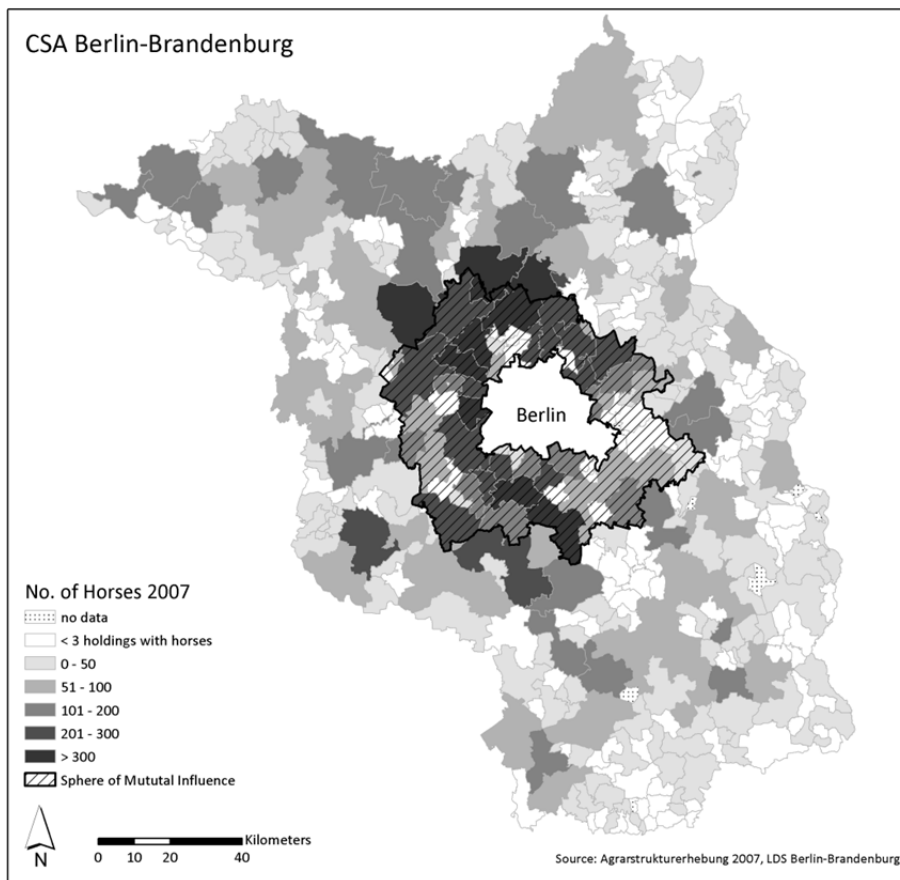


Figure 10. Distribution of horses kept in farms in the CSA Berlin-Brandenburg 2007. Source: LDS Berlin-Brandenburg.

Questionnaire Survey

The empirical research in the CSA of Berlin-Brandenburg was carried out to gain a much more detailed impression of the perception of farmers in regards to the peri-urban framework conditions and the mechanisms of their adaptation behaviour. Initially, two questionnaire surveys were planned to cover horse-keeping and horticultural farming, as well as archetypical types of agriculture in peri-urban areas (as identified in the cross-regional and cross-municipal spatial analyses carried out in paper II and III). In the case of horse-keeping farmers, a questionnaire was developed which covers three different categories of questions: Firstly, the farm household and business background; secondly, the farmers' perception of the peri-urban framework conditions, and, thirdly, their responding

activities. The questionnaire was discussed and pre-tested with experts from the horse-sports association (Landespferdesportverband Berlin-Brandenburg) and Brandenburg Ministry for Agriculture (Ministerium für Infrastruktur und Landwirtschaft) and sent out to a total of 330 horse-keeping farmers, obtaining a final response rate of 18% (n=59). The gathered quantitative data has been statistically analysed.

Horticultural Production

Horticultural production in the CSA Berlin-Brandenburg is characterised by a number of traditionally cultivated products of nation-wide importance, such as asparagus, fruit trees or cucumber. In 2005, the Brandenburg agricultural census counted over 800 holdings with primary or secondary occupation in horticulture producing on 12,000 ha of agricultural land (LDS 2006). Although horticulture represents only 0.9% of the total agricultural area and 12% of the total holdings, it accounts for about 20% of the net value added of the entire farming sector, thereby illustrating its economic relevance (MIL 2010). Horticultural production prevails in some traditional growing regions, such as the Spreewald, Havelland or the Oderbruch. However, according to the FSS 2007, particular concentrations of cultivation areas for fruits, vegetables and flowers can be found in municipalities within the peri-urban CSA, such as Werder (697 ha), Beelitz (1,296 ha) and Groß Kreutz (551 ha) to the South-west as well as Altlandsberg (346 ha) to the East of Berlin.

In-depth interviews

In the case of the horticultural farmers, serious data confidentiality issues emerged so that the preparation of the survey comparable to the horse-keeping case was not possible. In this situation, the decision to conduct in-depth interviews was taken following Patton's (2002: 253) suggestion for a methodological triangulation approach. Here, qualitative methods were applied to pragmatically respond to design constraints that excluded other methodological opportunities. As they allow in-depth inquiries into selected topics with qualitative methods, more attention was given to detail, context and nuance of the subject of study. Whereas quantitative approaches have the advantage of having a large number of respondents, the idea here is to move from studying the behaviour of larger groups towards focussing on individual observations that are generalised to the specific groups of farmers they represent. A deterministic, not-statistically probabilistic approach

was chosen to substitute the missing survey. The number of investigated cases was reduced through a theory-guided, purposeful sampling of archetypical cases to cover the variety of farmers under investigation as recommended by Patton (2002: 230 ff.). Working within an adaption-strategy spectre between active and passive adaptation (as well as intensification and extensification analogous to van der Ploeg's approach), the use of a farming-style approach, which is differentiated by *traditional*, *adaptive*, *phasing-out* and *innovative* types as a theoretical foundation, emphasised these aspects for the definition of farming styles. To ensure a required level of comparability between the interviewee cases, but allowing as much as possible for insights into individual perspectives, the *general guideline interview* method has been applied for the qualitative research. The interview guideline – a pre-developed list of questions – allows for exploratory topics in the course of the interview (Patton 2002: 343 f.). Content analysis has been performed to process the qualitative data.

4 Synthesis of Empirical Results

In the following section, the main results of the four explorative and empirical research papers are summarised and synthesised in regards to the previously formulated research questions addressing: (i) agricultural land-use change; (ii) the farm holder's perception of the prevailing peri-urban framework conditions; and (iii) the forming and adaptation of specific farming characteristics in PUA. The result synthesis represents the basic foundation for discussing development perspectives for PUA and implications of, as well as requirements for, policy and planning. Table 2 at the end of the section gives an overview of the research papers' key findings.

4.1 Peri-urban Agriculture – Activities and Urban Influence

Multifunctional agriculture has been examined in the land-based analyses on two different spatial scales – the farming community on regional (Paper II) and municipal level (Paper III) as well as farm-based analyses (Paper IV & V). Although the investigated European regions vary in terms of socio-economic framework conditions, geography, climate, predominant landscape and land-use, the peri-urbanisation of a respective region as well as the RUR classification (metropolitan, large and medium-size cities, rural) accounted for a significant influence on prevailing agricultural activities and farming systems. Agriculture in metropolitan regions and in regions with extensive peri-urban areas is characterised by specialised farming and horticulture and, to a minor extent, grassland and livestock production, whereas 'regular' arable production represents a feature of the rural areas (cf. Tab. 3, 4 & 5, Paper II). Farms in these regions compensate the limited and shrinking land-base through the generation of more revenues per ha area and higher labour-intensity. Positive correlation could be identified between peri-urbanisation variables and the horticultural specialisation of farms. (cf. Tab. 5 & Fig. 4a-d, Paper II). Highly peri-

urbanised regions, i.e. in the Benelux countries, Western Germany and Northern Italy, exhibit particularly highly specialised and competitive horticultural production.

These observations are further supported by the investigation of peri-urbanisation processes⁴ in the metropolitan region of Copenhagen (Paper III). Here, significant relationships exist between urban-related location determinants (i.e. population density, accessibility and distance to the urban centre) and the adoption of specific farming activities beyond the conventional arable production, such as organic farming schemes, horticultural production or the keeping of horses. Firstly, environmental-friendly farming schemes, such as extensive grassland and organic farming, prevail in some peri-urban municipalities in the northern part of the region. Secondly, horse-keeping activities to enhance the recreational function operated within the peri-urban landscape occur frequently in municipalities that are characterised by both high population density and ex-urbanisation, i.e. the in-migration of affluent urbanites. Thirdly, intensive greenhouse production is concentrated in the direct neighbourhood of the city of Copenhagen, making an important contribution to the food production function (cf. Fig. 3 & Tab. 4, Paper III). Particularly the relevance of the distance to the urban core has been confirmed in the spatial analysis of the Copenhagen study. With standardised Beta coefficients of 0.56 (horticulture) and 0.45 (horse-keeping), distance contributed significantly to the explanation of farm activity distribution.

4.2 Perception of peri-urban Framework Conditions

Exemplified by horticultural growers and horse-keepers, the case studies in the metropolitan region of Berlin (Paper IV & V) explore farm holder perceptions of peri-urban framework conditions. Both cases exhibit a distinct heterogeneity within the farming community in terms of farm structure and farming activities. It has been found that even within specific farming activity such as horse-keeping and horticulture, a broad spectrum of farmer types exists. In paper IV, farm types have been statistically differentiated into *Diversified traditional farms*, *Extensive horse-oriented farms*, *Hobby farms* and *Intensive equine service farms* which differ strongly in terms of land size and ownership, stocking rates,

⁴ Peri-urbanisation is here understood as processes of in-migration of specific social groups.

employment and specialisation (cf. Tab. 1, Paper IV). The investigation of the horticultural production sector also led to a necessary differentiation of farm types that took into consideration aspects of farm household and business structures as well as behavioural patterns. *Traditional* (type A), *Adaptive* (type B), *Phasing-out* (type C) and *Innovative* (type D) have been identified as archetypical farm types (cf. Fig. 2, Paper V).

Farm type Differences

In both empirical studies of the CSA Berlin, differences have been analysed between the various farm types in terms of their sensitivity towards, and perception of, strengths and opportunities, as well as the weaknesses and threats of the peri-urban framework conditions. In the example of horse-keeping farms, it was determined that there is a general tendency among farmers in peri-urban areas to realise strengths and development potentials had by being in the vicinity of the urban agglomeration (between 3.6 and 4.5, average 3.9)⁵, while being less sensitive to restricting conditions (between 2.4 and 3.9, average 3.0). Still, the perceptions are rather varied among the different farm types. Farms which rely the most on urban customers, (and are generally located closest to them⁶) such as specialised horse-keeping farms, appreciate the accessibility, urban proximity and good infrastructure in peri-urban areas and usually have a positive perception of the spatial framework conditions. In contrast, hobby farms, and to some extent traditional farms, are much less enthusiastic about the peri-urban location. They both perceive the strengths and opportunities less favourably and are more sensitive to the weaknesses and threats related to the spatial framework conditions. This is particularly surprising, since those are the farm holdings which are located even further into the countryside (cf. Tab. 2, Paper IV).

Among the horticultural growers investigated in paper V, the peri-urban framework conditions are seen much more ambivalently. The qualitative analysis of the interviews showed dominance of neither advantages, nor disadvantages, but rather differences occurring between the various types of farms. Attitude and value proposition of the

⁵ A five-point Likert scale was used to measure the response behaviour with the response levels 1 = “not agree”, 2 = “less agree”, 3 = “neutral”, 4 = “more agree”, 5 = “fully agree”.

⁶ 77% of the “Intensive equine service farms” are located within 10 km of the city border.

individual farm holder played an important role for the perception of the peri-urban framework conditions. While farm holders of a traditional or phasing-out type at least struggle with the hardships and conflicts related to the proximity with urban dwellers, more open-minded adaptive and innovative types hardly recognise any weaknesses or threats. They prefer to proactively make use of the existing market opportunities, since they have specifically chosen the very peri-urban location in question.

Urban Opportunities

In papers VI and V, mainly aspects of urban market opportunities and the infrastructural situation, as well as their perceived importance for farming activities, have been surveyed. On average, there is some agreement (3.6) that both infrastructure and the existing urban demand represent strengths for farmers in the peri-urban fringe of Berlin to start an equine service activity. Ranked even higher is the potential importance of the urban proximity (4.0) and accessibility to urban consumers (4.5). No significant results were found regarding type-specific differences in the evaluation of the current infrastructure and urban demand situation. Only specialised equine service providers stand out with their high regard of their proximity to Berlin (4.6) and accessibility to customers (4.9). Accordingly, they have developed specific urban-oriented services, such as social and therapy services (62%) or horse-pension services (85%), while showing low interest in area-intensive activities such as fodder production or the implementation of agri-environmental measures, which do not require close proximity to the city (cf. Paper IV).

All the horticultural farm holders interviewed acknowledged the proximity to urban consumers and access through transportation infrastructure as important location factors, which they utilize through various types of short food-supply chain measures (i.e. just-in-time supply for local processing and canteens, farm shops, box services). Here, it was surprising that particularly the traditional and phasing-out producers (type C) have very intensive ties to customers in the urban area of Berlin and Potsdam – even more so than the adaptive farmer (type B) who has purposefully chosen the peri-urban location to establish his farming activities (cf. Paper V).

Urban Pressures

Among the weaknesses and threats, the particularly high land prices (between 2.0 and 4.1, average 3.4) and the limited expansion opportunities (between 3.0 and 4.4, average 3.9), of the land market have been assessed as the main restricting factors for peri-urban horse-keeping farms, whereas the issue of short rental contracts was hardly seen as a problem (between 1.7 and 3.2, average 2.4). However, the results exhibit strong variations between the different types. Extensive horse-oriented farms tend to own their land. They are also located further away from Berlin. Owners here mainly see the limited expansion possibilities (3.0) and short rental contracts as problems (1.7), whereas the small-scale, intensive farm holdings worry mostly about land shortage (4.0), land prices (4.1) and the long term perspective (3.2) (cf. Paper IV).

The results from interviews with horticultural farmers in the Berlin peri-urban area also suggest that land shortage and uncertainties about land-use changes have only a minor affect on the farm holders' decision-making process. Despite their direct proximity to urban areas (mainly low density residential housing), there is a common trust in existing municipal zoning legislations to safeguard a long-term planning perspective for agricultural land-use. The innovative farmer in particular bases their future development perspective strongly on the informal interaction with, and support from, the urban neighbourhood (cf. Paper V).

Among the horse-keeping farm holders, the pressure from the competition with urban land-use is perceived as much less of a problem than the general land market situation. The large-scale traditional farms (1.9) and the extensive horse-oriented farms (1.9) mostly disagree with such a statement, whereas it represents an issue for hobby farmers (3.3) and the intensive producers (3.3). Other disadvantages of the peri-urban location, such as conflicts with the direct neighbourhood (2.6) and legal restrictions (2.7), are less important for horse-keepers and show no significant differences between the different farm types (cf. Paper IV). However, the in-depth interviews with the horticultural farmers revealed a somewhat contrasting picture. The traditional, phasing-out farmer, and, to a lesser extent, the innovative, socially-embedded farmer regularly witness neighbourhood conflicts (e.g. trespassing, theft, vandalism and free-roaming dogs). The traditional farmer even experiences neighbouring residents complaining about the exposure to farming-related noise and dust.

4.3 Farm Adaptation and Multifunctional Development

By studying the producer-consumer relationships of peri-urban horticultural growers in the metropolitan area of Berlin, a high degree of specialisation in the production of fruit and vegetables was found. Only the adaptive and the phasing-out type have established animal husbandry activities. All have developed a strong urban-market orientation, relying completely on the level of urban demand, since the production is entirely sold in the Berlin metropolitan region. Therefore, different direct marketing and short supply links to customers have been established: direct relations to a near-urban processor (traditional farmer), farm gate purchase (adaptive), farmers' markets, food boxes and local canteens (phasing-out farmer) and pick-your-own (innovative) (cf. Paper V).

The spatial distribution of farm holdings with a typical post- or non-productive activity, such as horse-keeping, exhibits a concentration within the inner urban fringe. In the case of the Berlin metropolitan region, an overwhelming share of 77% of all horse-keeping farms is located within a distance of 10 km from the city border (cf. Paper IV). About one third of the surveyed farms have established horse-keeping as a sideline activity to broaden their income base. It has been shown that their contribution to a multifunctional peri-urban countryside goes beyond the additional provision of recreational services. Often social and educational services are jointly established. Particularly in the case of more extensive and diversifying farm types, the holding of horses keeps pastures in less-favoured areas and redundant farm buildings in operation and also contributes to the maintenance of the cultural landscape. Fodder requirements (composition of grass and herbs), pasture management and agri-environmental measures especially bring about other ecological values such as habitat and biodiversity or water balance.

Taking horse-keeping and horticultural production as two typical examples of peri-urban agricultural activities, a general tendency towards multifunctional adaptation can be recognised on individual farms, but even more within the peri-urban farming community and countryside as a whole, bearing in mind the heterogeneity of farming types, their activities carried out and consequently the functions they provide.

Table 2: Overview of the main findings.

Urban influence on peri-urban agriculture
<ul style="list-style-type: none"> • Continuation of farm loss in metropolitan and peri-urban areas • Heterogeneity of farming activities, farm types and farm sizes (bi-modal distribution) within the peri-urban farming community • Intensity of labour and revenues generated (Compensation to limited land resource) • Urban-market orientation of activities (frequent horticulture and horse-keeping) • Less conventional arable farming (property of the rural domain)
Perception of peri-urban framework conditions
<ul style="list-style-type: none"> • Major differences between farm types (traditional, adaptive, innovative, hobby/phasing out) • Emphasis of strengths and opportunities (accessibility and proximity to urban consumer valued) • Weaknesses and threats less important (Land market and legal restrictions play only minor roles)
Multifunctional Adaptation
<ul style="list-style-type: none"> • Diversity of farming systems and activities contribute to multifunctionality of the peri-urban • Frequent diversification and direct marketing initiatives • Horse-keeping as contribution to the recreation function • Extensive grassland management through horse-keeping

5 Discussion

The research issue of agriculture in peri-urban areas has been addressed from different spatial and farm-based perspectives. In the following section, the empirical results related to the characteristics of agriculture under urban influence and in peri-urban areas are discussed in terms of their agricultural activities and farming systems. Here, the examination of the perception of urban pressures and opportunities as well as adaptation strategies and the corresponding farming activities used by farmers are reflected within the wider context of agricultural and land-use research. It needs to be verified whether, firstly, the image of an adaptive, post-productive and multifunctional PUA can be substantiated, and if so, secondly, specific development perspectives of the peri-urban farming community can be derived from it. Furthermore, the ability and capacity of spatial planning and regional development policy to comply with the requirements of a multifunctional PUA are also discussed.

5.1 Perspectives of multifunctional peri-urban Development

Taking into consideration the research results at hand, agriculture in peri-urban areas is exposed to severe urbanisation pressures related to land availability, especially in metropolitan regions, as urban growth there, to a large extent, takes place at the expense of farmland. In addition, neighbourhood conflicts, limitations and nuisances linked to farm activity itself have been reported. However, despite its declining role for the regional economy, agriculture continuously represents the main peri-urban land-use actor. Overall, the framework conditions do not seem to cause any anxiety among the farm holders, as they perceive more advantages than deficits. At the same time, it has been revealed that PUA in many regions across the EU and within the Copenhagen-Zealand and Berlin-Brandenburg CSA is highly competitive and multifunctional in terms of the diversity of

activities carried out on either single farms or within the farming community. In the following section, the main development perspectives of PUA that can be derived from these results will be discussed, and which perspectives correspond to the initial hypotheses of this dissertation: (i) the urban-market orientation, (ii) the innovation and flexible adaptation capacities and (iii) multifunctional development opportunities.

Urban-market Orientation

Despite decades of urban demand for food supply being de-coupled from its rural hinterlands, the empirical results of the various case studies indicate a continual presence of producer-consumer relationships between urban centres and peri-urban farming communities. Farm holders have acknowledged the customer potential stemming from a nearby urban location, since they have specialised on horticultural products relevant to the urban market and established different forms of direct marketing schemes. This was particularly evident in the findings from the agricultural land-use analyses of the papers II and III. The spatial analyses across European RUR regions and the examination of the agricultural communities in the Copenhagen regions have indicated an orientation of farming activities that serve the requests of the nearby urban market, since equine services and the production of horticultural products (cf. Tab. 5, Paper II & Fig. 3, Paper III) showed particularly strong spatial concentrations in peri-urban areas. The frequent provision of these goods and services by agriculture in peri-urban areas, which are characterised by the in-migration of affluent residents, is particularly evident in the CSA Copenhagen. This indicates the relevance of local demand and purchasing power as incentives for farmers to carry out these activities. Such findings substantiate previous research results. In their study on short supply chains in the peri-urban area of Paris, Aubry et al. (2008) found that at least half of the horticultural farmers there have established short food links to urban consumers, in part to help cope with domestic and global competition.

However, these relationships do not play an eminent role in the urban food supply, as they are limited to certain segments of the product palette only, particularly fresh and perishable food – a situation which has not changed ever since it was recognised (Bryant & Johnston, 1992). The urban-rural relationships appear to have intensified when broadening the perspective from food production to other functions and services that agriculture provides for urban areas, namely in the provision of recreational services such as equine services, but also through the participation in other diversification measures that are

particularly pronounced in peri-urban farming communities. In the literature review (Paper I), empirical evidence was found that suggests an increasing consumer demand for regionally produced food (Boulanger et al. 2004, van Huylenbroeck et al. 2005) and rural goods and services in general (Buciega et al. 2009). Also, the popularity of urban agricultural initiatives and *community supported agriculture* indicates a desire to bring agriculture and food production closer to urban society, with urban dwellers themselves increasingly involved in gardening, food harvesting and distribution activities (Garnett 2001, Rosol 2010). This growing interest in, and awareness of, local food represents a serious development opportunity for PUA as a regional food producer and provider of recreational services, and effects the peri-urban development in a number of ways, including: increasing the net value added for regional farming households, synergy effects with landscape management,(Knickel & Hof 2002, Roep 2002), as well as ensuring local embeddedness and trust-building with consumers (Hinrichs 2003).

As argued by Buciega and colleagues (2009), however, the opportunities of these urban-rural consumer-producer relationships are only marginally captured due to insufficient systems of management and the inadequate coordination of bringing together peri-urban producers and urban consumers. Developing new institutional arrangements for common marketing and cooperation activities for regional (quality) production and direct marketing has been suggested as a way of increasing the accessibility of local and regional markets, such as intermediate management actors, cooperative and regional trademarks (Roep 2002, Knickel et al. 2002). Brunori and Orsini (2010) further emphasised the importance of involving the local community and the implementation of actor-networks for the consolidation of peri-urban agriculture and the establishment of local food supply. Finally, shorter supply chains and regional marketing have become objectives of the European agricultural policy as a priority in the rural development support towards 2020 (COM 2011), emphasising their assigned role for regional development.

Innovation and flexible Adaptation Capacity

Empirical results about the uptake of alternative means to generate revenues through diversification within and beyond agriculture (as well as the urban market-oriented specialisation) strongly indicates a pronounced capability of peri-urban farming communities to adapt to the prevailing framework conditions as determined by the proximity to urban areas. Despite existing inconveniences and disadvantages of bordering

urban areas, it is noticeable that farming in the urban fringes is everything else but a marginalised and pressured land-use object ripe for speculation, or indeed is it simply land reserved for future urban expansion. To the contrary, and particularly at the urban fringes, agriculture was found to be very 'lively', rather intensive and diversifying, as well as innovatively and actively dealing with the prevailing framework conditions and making use of the existing comparative advantages. Some farms have even been explicitly established deliberately in near-urban location with a long-term perspective. In their comparative study of vegetable production in different European metropolitan regions, Péron and Geoffriau (2007) confirmed that despite urban pressures and the growing competition of large-scale agriculture, peri-urban vegetable growers have developed specific strategies to ensure the continuation of production, namely specialisation of certain crop types, area concentration and water management.

The innovative capacity and adaptation ability of peri-urban farmers can be attributed to the heterogeneity of the peri-urban farming community found within various farming types, including the specific role of 'alternative' and hobby farms, and the activities carried out therein. The analysis of their adaptation behaviour showed that peri-urban farmers substantially vary depending on the socio-economic characteristics (business and household structure) – those being either traditional, adaptive, innovative, or hobby farmer. Depending on the farm type, strong differences were found regarding the intensity, investment volumes, diversification activities, relationships to customers, marketing strategies, and the integration and communication with urban society in general. Among horticultural farms, for example, large scale, traditional producers were found who do not diversify at all, but who have adjusted their production according to customer requirements. On the other hand, small-scale farmers were found who seek to intensify the dialogue and exchange with urban dwellers, either as communication and feedback with direct customers to acquire knowledge on (changing) preferences, through to the participation in innovative local food systems, or the involvement of informed and interested urban residents in the gardening activity without any pressure to farm economically, but as an expression of lifestyle and personal fulfilment. Thus, peri-urban horticultural farmers apply a broad spectrum of mechanisms to utilise the urban proximity not only as a market but also as a source of information and knowledge.

To a large extent, these findings align with existing farm typology models applied to peri-urban or metropolitan agriculture. The differentiation of traditional, adaptive and

hobby farming has been frequently observed in other regions (Heimlich & Barnard 1997, Van Huylenbroeck et al. 2005, Cicia et al. 2008). The coexistence of different farm types and the diversity of farm strategies enhance the overall ability to adapt to changing demands and the availability of resources, to occupy and exploit niches, as well as to adopt innovations and technologies in production, processing or marketing of products – therewith strengthening the resilience of the peri-urban farming community as a whole. Among peri-urban farmers, the roles of hobby and alternative modes of farming are particularly interesting. As their motivation is not economically driven, they perceive and carry out agricultural activity for leisure and reasons of self-fulfilment. It was observed that they adopt organic production schemes and innovative modes of organisation and production. The spatial correlation between the in-migration of affluent parts of the population and the prevalence of organic production schemes in the CSA Copenhagen supports this reasoning. Alternative concepts include a strong transitional element as a sort of intermediate land-use, keeping farmland in production in environments of dynamic land-use developments. The presence of hobby farmers has been understood as important for the innovation process within a farming community. Due to their low economic pressure and financial risk, hobby farmers adopt new technologies (machinery, seeds, etc.) often before their regularly producing neighbours, who tend to implement them at a later stage (Bryant & Johnston 1992, Præsthalm et al. 2007).

Multifunctional development

Multifunctionality of PUA was analysed from two different perspectives – from the individual farm level, as well as from a regional level covering landscapes and farming communities. In regards to farm adaptation behaviour, it was found that the agricultural community in peri-urban areas has developed along the lines of intensive and specialised farming (deepening) and lifestyle-oriented activities diversification (broadening) at farm level over time – a process determined by the spatial conditions of the peri-urban framework conditions (and here, first of all, by the level of urban demand). This indicates that peri-urban areas have been exposed to the post-productive turn in agriculture, which means that the countryside is commodified to provide functions and values beyond commodity production as Clouth (1998) and Marsden (2003) have argued. The frequent occurrence of horticultural production (purposefully in proximity to the city), however,

questions this line of argument, as it can be assumed that the importance of local food production has increased even further.

The spatial analyses of regional (Paper II) and local agricultural structure (Paper III) found that PUA is characterised by the presence of multiple farming activities, from intensive horticulture and greenhouse production to equine services and landscape management such as extensive grassland. Although the degree of pluriactivity and diversification of the surveyed farms was limited, indications for a multifunctional character of PUA could be recognised when the perspective was shifted from the individual farm to territorial, as suggested by Marsden & Sonnino (2008). Considering the whole peri-urban farming community, there is larger diversity of multiple functions and values for urbanised regions – namely quality food provision, leisure and care services, and landscape management. The prevalence of agricultural activities in the CSA Copenhagen (Paper III) provides evidence in this direction. As shown in the literature review (Paper I), a high degree of compliance between urban demand and peri-urban supply can be deduced from the multiple demands and interests in urban areas for environmental quality, amenities, outdoor recreation, leisure and regional food heading the list. Together with the environmental and cultural landscape values connected to the agricultural activity, the increasing relevance of local food supply and the diversification within and beyond agriculture, the strengthening of social and cultural values indicates a transition of the peri-urban area into a landscape of Wilson's (2008) strong multifunctionality.

5.2 Public Intervention – Institutions, Policy and Planning

It has been previously discussed that a number of development perspectives exist for agriculture in peri-urban areas thanks to a closer linkage to the urban market, innovation and adaptation capacity, as well as for its multifunctional structure. At the same time, urban pressures and disturbances, such as farmland lost to urbanisation, threaten the territorial basis and economic viability of farming. Therefore, requirements for a regulatory framework – institutions and instruments such as agricultural and rural development policy and land-use planning to maintain and strengthen farm activity in the peri-urban fringe – need to take prevailing framework conditions and development potentials into consideration. These specifics, which are different to other rural areas, have to resonate in

the design of the respective planning instruments and spatial development policies that currently neglect peri-urban areas and their requirements. Its reflection in the context of public intervention through institutions, policy and planning departs from the discussion part carried out in the review paper I, but extends and deepens it further to incorporate the local, regional and European level including (i) land-use planning and zoning instruments, (ii) regional governance and (iii) agricultural and rural development policy.

Preservation of peri-urban Farmland

One basic objective of policy and planning in peri-urban areas is the preservation of farmland in general. It concerns the basis of all agricultural activity, since the conversion of farmland for urban purposes continues unabated, as has been argued above. In order to sustain agricultural activity in the peri-urban areas of metropolitan regions, instruments of public intervention through urban containment and growth management policies are required (Piorr et al. 2011). Combined with financial incentives, zoning and urban growth boundaries represent the main planning instruments, such as the Green Belts in the UK (Gant et al. 2011), regional and comprehensive planning (e.g. with priority areas) in Germany (ARL 1999), Scheme of Territorial Coherence (SCoT) in France (Buyck et al. 2010) or more regional approaches, such as the Copenhagen 'Fingerplan' (Vejre et al. 2007) or the Green Heart within the Randstad metropolitan region and buffer zones in the Netherlands (Koomen et al. 2008).

The main idea of these concepts is to geographically define zones adjacent to urban areas where urban development is prohibited or limited to prevent encroachment of urban sprawl into the peri-urban open spaces. Adopted in the different countries between the 1930s and 1960s, these zoning schemes have become relatively important and successful in limiting urban growth in the designated areas: developments have been postponed (Gant et al. 2011), general urbanisation rates were reduced (Koomen et al. 2008) and structural requirements for open-space development have been retained (Vejre et al. 2007). Additionally, territorial separation allows for the co-existence of conflicting land-uses within the peri-urban area, either production-intensive, or leisure and environmentally oriented (Daniel & Perraud 2009).

However, the actual impact of these zoning measures on land preservation is a moot point. By not limiting urbanisation potential in general, restrictions within the open

space zones only redistribute development pressure to areas adjacent to them. As Robinson (2004) has argued, containment policies put additional pressure on the suburban neighbourhoods and brownfield re-development inside the Green Belt, and encourage ex-urban leapfrogging outside of it. Furthermore, changing growth boundaries, local calls for restriction easements, and uncoordinated municipal planning and development permissions (which have been observed in various regional settings) have all raised doubts about the zoning measures' preservation ability (Vejre et al. 2007, Koomen et al. 2008, Gant et al. 2011).

Planning for Multifunctional Agriculture

The criticism applies even more to the multifunctional development of farming in the peri-urban area. Open space preservation comes under the purview of natural areas rather than farmland. Although natural areas are highly valued by the public from an environmental and aesthetic perspective, farming is only given a marginal reason to survive in peri-urban areas (Koomen et al. 2008). More societal acknowledgement is required for the functions and values agriculture can provide to the urban society, such as local food and comparably cost-efficient provision of landscape features. Kerselaers et al. (2011) have called for a clear vision as to how and where agricultural land under pressure should be preserved. Furthermore, zoning-type land-use planning with its mono-functional approach to land-use is often rather ill-prepared to respond to multifunctional land-use challenges such as horse-keeping and other urban-like diversification activities which cannot clearly be attributed to the agricultural areas. Typically, zoning legislations are undermined through the spread of non-agricultural land-uses on farms, or the switch from full-time farming to the consumption-oriented use of hobby farmers and residents (Vejre et al. 2007, Bomans et al. 2010). In contrast to planning methods aiming at prescribing durable land-use, the regulation of a peri-urban, post-productive and multifunctional agriculture requires a greater flexibility to respond to the dynamic transitions and the mixture of land-uses.

British scholars such as Shoard (2002) as well as Gallent and colleagues (2006) have criticised the adoption of preservation-planning like the Green Belt in the urban fringe as a defensive preservation approach that rather reinforces the urban-rural divide in planning, while lacking a positive and visionary development agenda. Gant et al. (2011) have formulated the need for a proactive approach with a specific peri-urban agenda. However, it can be agreed that it is necessary to actively control the transformation of the peri-urban

agriculture as well as its diversification process and supervise the targeted provision of environmental services to meet urban societal demands, while also carefully reflecting the region's prevailing natural characteristics and potentials.

Both Gallent et al. (2006) and Rode et al. (2006), for instance, have argued for an implementation of consensus-oriented concepts of commonly shared, multipurpose land to enable closer multifunctional development by spatial and temporal integration of multiple activities and intermediate agricultural land-use approaches. In this context, Ryan and Hansel Walker (2004) and von Haaren and Reich (2006) have highlighted the necessity of farmers' participation as main land managers in implementing this kind of multifunctional greenway planning. Similarly, Leinfelder (2009) proposed an adaption of the traditional zoning practice in the case of open space planning. Instead of a geographical definition of a future land-use, he suggests a *strategic zoning* approach that describes purposes and contextual conditions. This appears particularly promising, since it provides a planning opportunity to formulate and support the required co-existence of the same entity's multiple purposes.

Regional Governance

While formal zoning-based planning instruments represent measures to provide a legal basis to curb the physical land-use transition of agricultural areas, governance-based approaches can be applied to encourage the multifunctional development of peri-urban agriculture itself, thereby strengthening the urban-rural relations, adaptive and innovative character of the agricultural sector, as well as the heterogeneity of the peri-urban agricultural community in terms of farm types and the activities carried out. The literature review (paper I) has shown that there are multiple ecological, economic and societal claims and requirements on the peri-urban countryside and the multiple goods and services it should provide. Applying adaptation strategies either to deepen, broaden or re-ground activities, peri-urban agriculture already copes with these demands in terms of marketable goods and services. To some extent peri-urban farmers have actively established connections to urban consumers. Still, the relationship between urban society and peri-urban farming is first of all characterised by mutual disregard, land-use competition and conflict. Therefore, encouragement of urban-rural linkages and enhancement of the integration of the peri-urban countryside in spatial development strategies for urban regions is suggested by the European Spatial Development Perspective (ESDP) (COM 1999). New

managerial and governance mechanisms are necessary to negotiate the multiple conflicts and common interests of urban and peri-urban actors and the different types of farmers in the limited and complex peri-urban space. More integrated, holistic and spatial approaches, and a common rather than a sectoral framework of action have been repeatedly suggested (Marsden 1999). The EESC (CES 2004) has called for participatory and managerial based “*supra-municipal management projects*” dealing with cross-sectoral issues in the peri-urban, its land-use and the role agriculture should play within it.

Examples of such governance approaches are inter-municipal co-operations, or the establishment of territorial units covering urban and peri-urban legislative bodies. Using the example of the Ile-de-France region, Guiomar (2010) for instance outlines how municipal and regional entities support farming in peri-urban areas by addressing multiple objectives, such as land market, land access, agricultural production structures, product quality, environmental quality, marketing or integration into the local cultural heritage. A variety of measures has been proposed, including financial support (e.g. for purchasing farm-land, financial incentives to set up farms, diversification and agri-environmental production), valorisation of the agricultural landscape (e.g. pathways and orchard planting) or information and awareness rising (e.g. inventories of fallow land, certification and branding of products, competitions, festivals and the use of media).

The establishment of regional and landscape parks represents another example to integrate urban and rural actors within regional participatory approaches. Often intended as a means of valorising the landscape via a form of environmental protection or a form of touristic infrastructure development, sustainable, multifunctional agricultural-use nevertheless also represents a frequent objective, such as currently found in the regional parks of Berlin-Brandenburg. Here, strategic-development concepts for the peri-urban area have been formulated based on a co-operation network of peri-urban municipalities, Berlin district administrations, regional authorities, as well as other actors involved in the peri-urban economy, society and the field of nature protection. Objectives and specific measures have been set up to enhance regional marketing and quality production through the establishment of a regional trademark, regional supply chains, as well as quality and quality management. Further objectives are the support of environmentally oriented and organic farming schemes, as well as agriculture-related tourism (Regionalpark Barnimer Feldmark 2007).

Focussing on agricultural competitiveness and preservation issues in peri-urban areas, agricultural parks such as in Barcelona (Parc Agrari del Baix Llobregat) and Milan (Parco Agricolo sud Milano) present exemplary approaches to maintaining and strengthening agricultural land-use in peri-urban areas under pressure by including their territorial base as well as their ecological, cultural and productive values. The projects cover modernisation and competitiveness of agriculture, regional branding and marketing, and resource protection (Montasell & Callau 2008) and the implementation of agri-environmental schemes, the establishment of agricultural information systems, as well as the promotion of regional marketing for organic agriculture (Scelsi 2002). These all represent valuable examples of how the multifunctionality of PUA can be addressed through regional governance approaches. The participation of regional actors from urban society and the peri-urban farming community allows for the setting up of development objectives and implementation measures that are relevant to the specific regional circumstances.

Rural Development Policy

Rural Development Programmes (RDP) have been introduced as a political instrument to promote the “*multifunctional role farming plays in the richness and diversity of landscapes, food products and cultural and natural heritage throughout the Community*” (COM 2006: 2) as a second pillar of the European Common Agricultural Policy (CAP). Compared to the agricultural market intervention of the direct single farms payments, the RDP represent a more programmed approach guided by overarching objectives – competitiveness (axis 1), environment and countryside (axis 2), quality of life in rural areas and diversification (axis 3) and LEADER (axis 4) as a territorial community-based approach. Therefore, strategic guidelines are set up at an EU level, while, based on subsidiary principles, specific measures are defined to be selected for RDP design on national and regional levels. By principle, Rural Development is therefore able to take into account regional (peri-urban) specifics, and represents a suitable support instrument to address typical peri-urban issues, such as the diversification, innovation and modernisation.

The design of the support schemes – in terms of the intervention logic of eligibility criteria – does not reflect the requirements of peri-urban agriculture and even excludes it from the funding scheme. The Rural Development programming instead focuses on a continuous and uniform rural area, as van Berkel & Verburg (2010) criticise, and is

particularly ill-prepared to meet the requirements of, and set incentives for, the development of a heterogeneous and dynamic peri-urban farming community with small, intensive and specialised farms that are both extensive and diversified. To comply with the specific urban pressure and development trajectories, agriculture and rural development schemes require a more pronounced regional targeting that is oriented towards the specifics of the region and the beneficiaries in PUA, as has been suggested by Piorr et al. (2011). The intervention needs to be tailored to small and active farmers. Multifunctional farming activities are not solely performed by farmers, particularly in peri-urban areas, but by other (groups of) actors and land owners, e.g. associations or on municipal jurisdictions. Changes to eligibility criteria are therefore necessary, such as minimum farm sizes or long contract durations for the participation in agri-environmental schemes that inhibit any flexible response to changed land-use conditions. Further measures are necessary to more specifically address peri-urban issues, such as the encouragement of urban-rural relationships and the demand-oriented provision of collective goods and services. Also, specific peri-urban farming types and activities such as horse-keeping or specialised horticultural production need to receive further attention.

In addition, the legal definitions of *rural* areas that often excluded peri-urban areas from eligibility need to be questioned. By referring to the OECD (2007) definition of *intermediate* and *predominantly rural regions*, some RDP explicitly exclude peri-urban farmers from certain funding schemes. An alternative approach is chosen, for instance, in French rural development, where the peri-urban zone as *peri-urban and rural crowns* is explicitly included in the RDP intervention (EN RD 2011). In the consultation process for the reconfiguration of the CAP towards 2020, it has in general been emphasised that the PUA requires specific attention (COM 2010).

6 Conclusion

At its commencement, four central objectives were formulated to guide the research carried out in the context of this dissertation thesis – (i) from the juxtaposition of urban demand and peri-urban supply of agricultural functions and values, (ii) the analysis of the characteristics of PUA under urban influence, (iii) the examination of farm holder perceptions on urban pressures and opportunities as well as their corresponding adaptation strategies, and finally (iv) the identification of suitable modes of regulatory intervention to foster the multifunctional development of peri-urban agriculture.

Addressing the *first research objective* of this dissertation thesis, it can be reasoned that the peri-urban area represents an important part of the rural sphere, as it is the very place where the societal demand for rural goods and services from urban areas is concentrated. Alongside forestry, agriculture plays a key role in managing open landscape and therefore provides valuable public goods and services to the nearby urban areas. Along with forests and other natural area, farmland contributes to the ecological capacity, since it provides functions like groundwater replenishment, flood control, urban climate moderation and carbon sequestration. As an integral element of the cultural landscape in peri-urban areas, agriculture is further appreciated for its provision of the visual and landscape amenities. The surrounding countryside of cities and agglomerations has become increasingly relevant as a recreational space. Urban dwellers benefit directly in terms of living conditions and quality of life. Driven by consumer awareness for food quality and renewed town-country relations, interest in localised supply of food has increased. Despite that, post-productive demands play an important role in the peri-urban countryside. These demands are felt within an area of tension between synergy and a jointness of production, as well as conflicts with other land-use claims within and beyond the realm of agriculture.

Agriculture under urban influence – in metropolitan regions or more specifically in peri-urban areas – exhibits substantial differences to its more remote rural counterpart.

Aiming at *objective two*, the exploration of peri-urban agriculture has delivered indications that farming communities at the urban fringes have already responded to these emerging demands. Empirical evidence for intensified, small-scale agriculture, focussing on horticultural products and the generation of higher income revenues has been found alongside extensified, environmental-oriented grassland cultivation associated with lifestyle-orientation and the prevalence of equine service. The expansion of horse-keeping and other recreational services, quality and organic food schemes linked with direct marketing activities or small-scale and extensive lifestyle farming only represent the most prominent examples of growing trends in PUA that lead to further differentiation of the farming community.

Particularly when examining individual perceptions of peri-urban framework conditions by farm holders and their response behaviour under *objective three*, it was revealed that the proximity to the urban market is well-acknowledged by horticultural and horse-keeping farms. In the case of these two types of agricultural activity, the opportunities related to the urban influence outweigh the disadvantages in the eyes of farm holders. Accordingly, guided by their awareness of the urban consumer demands, they have either deepened or broadened their activities to comply with the multiple urban demands and desires by making adjustments to their farming activities along the food-supply chain, like direct marketing as well as by establishing on-farm diversification. The heterogeneity of the farming community as a whole, its multifunctional adaptation strategies and economic activities brings about a peri-urban countryside which provides multiple functions and values.

Therefore, it is necessary to acknowledge the peri-urban countryside as an individual policy arena to overcome the urban-rural divide and strengthen urban-rural relationships by coordinating the interests and conflicts of land-users within and beyond agriculture, but also by generating synergies and bringing together demand and supply that requires more governance-oriented approaches. But to conclude on the *last objective*, the development of peri-urban areas will nevertheless not go without incisive planning instruments. In the face of the enormous pressure from urban growth, measures of urban containment and zoning measures are also necessary to safeguard the preservation of open-spaces in general, and agricultural land-use more specifically. In this context, proper ways need to be found to deal with the blurring frontiers and hidden developments from urban and farming land-uses, as well as the definition of (multifunctional) peri-urban agriculture

itself. Last but not least, further public interventions through targeted agricultural and rural development policies are necessary to encourage the otherwise marginalised farming land-use in the peri-urban area, and to valorise the functions and values it provides for the urban areas nearby.

In recent decades, many peri-urban hinterlands of urban centred-regions have undergone a transformation into a post-productive, consumption-based countryside. But despite the reduced relevance of pure commodity production and the increasing amount of competing land-use claims (such as housing), agriculture in peri-urban areas has a *raison d'être* in the future. Although the continuing conversion of farmland for urban purposes – housing, commercial and industry, as well as the corresponding infrastructure – is almost entirely carried out at the expense of agricultural area, it is important to note that agricultural activity exists right on the city's doorstep, where a considerable amount of area is cultivated and managed, food produced, people employed and rural communities kept liveable. It is not just a space reserved for future urban development, but a comprehensive, self-sufficient economic and land-use activity.

Bibliography

ARL (1999). *Grundriss der Landes- und Regionalplanung*. Akademie für Raumforschung und Landesplanung (ARL), Hannover.

Allen, A. (2003). Environmental planning and management of the peri-urban interface: perspectives on an emerging field. *Environment and Urbanization* **15**(1): 135-148.

Statistik Berlin-Brandenburg (2008). *Bevölkerungsprognose des Landes Brandenburg 2007-2030*. Statistischer Bericht A18-07. Amt für Statistik Berlin-Brandenburg, Potsdam

Angus, A., Burgess, P.J., Morris, J. and Lingard, J. (2009). Agriculture and land use: Demand for and supply of agricultural commodities, characteristics of the farming and food industries, and implications for land use in the UK. *Land Use Policy* **26**(S1): S230-S242.

Antrop, M. (2000). Changing patterns in the urbanized countryside of Western Europe. *Landscape Ecology* **15**(3): 257-270.

Antrop, M. (2004). Landscape change and the urbanization process in Europe. *Landscape and Urban Planning* **67**: 9-26.

Aubry, C., Kebir, L., Pasquier, C., Traversac, J.B. and Petit, C. (2008). Transitions in peri-urban agriculture: how short supply chains evolutions question research. Examples and emerging researches in the Ile de France. In: Conference *Transitions towards sustainable agriculture, food chains and peri-urban areas*. Wageningen, The Netherlands, 26-29 October 2008.

BBR (2005). *Raumordnungsbericht 2005*. Bonn: Bundesamt für Bauwesen und Raumordnung (BBR).

Beauchesne, A. and Bryant, C. (1999). Agriculture and Innovation in the Urban Fringe: The Case of Organic Farming in Quebec, Canada. *Tijdschrift voor Economische en Sociale Geografie* **90**(3): 320-328.

Benevolo, L. (1986). *Die Geschichte der Stadt*. (3ed.). Campus Verlag, Frankfurt.

- Bergstrom, J.C. (2005). Postproductivism and changing rural land use values and preferences. In: Goetz, S.J. Shortle, J.S. and Bergstrom, J.C. (Eds.). *Land Use Problems and Conflicts*. Routledge, London and New York, pp. 64-76.
- Berry, D. (1978). Effects of Urbanization on Agricultural Activities. *Growth and Change* **9**(3): 2-8.
- Bomans, K., Steenberghen, T., Dewaelheyns, V., Leinfelder, H. and Gulinck, H. (2010). Underrated transformations in the open space--The case of an urbanized and multifunctional area. *Landscape and Urban Planning* **94**: 196-205.
- Bontje, M. and Burdack, J. (2005). Edge Cities, European-style: Examples from Paris and the Randstad. *Cities* **22**(4): 317-330.
- Boulanger, A., Meert, H. and Van Hecke, E. (2004). The societal demand for public goods in peri-urban areas: A case from the Brussels urban region. In: 90th EAAE Seminar *Multifunctional agriculture, policies and markets: Understanding the critical linkages*. Rennes, France, 28-29 October 2004.
- Bouraoui, M. (2005). Agri-urban development from a land-use planning perspective: the Saclay Plateau (France) and the Sijoumi Plain (Tunisia). In: Mougeot, L.J.A. (Ed.). *Agropolis: The social, political and environmental dimensions of urban agriculture*. Earthscan, London, pp. 203-238.
- Bowen, S. and de Master, K. (2011). New rural livelihoods or museums of production? Quality food initiatives in practice. *Journal of Rural Studies* **27**(1): 73-82.
- Bowler, I.R. (1985). Some consequences of the industrialisation of agriculture in the European Community. In: Healey, M.J. and Ilbery, B.W. (Eds.). *The industrialisation of the countryside*. GeoBooks, Norwich, pp. 75-98.
- Bowler, I.R., Clark, G., Crockett, A., Ilbery, B.W. and Shaw, A. (1996). The development of alternative farm enterprises: A study of family labour farms in the northern Pennines of England. *Journal of Rural Studies* **12**(3): 285-295.
- Brandt, J. and Vejre, H. (2004). Multifunctional landscapes - motives, concepts and perspectives. In: Brandt, J. and Vejre, H. (Eds.). *Multifunctional Landscapes, Volume I - Theory, values and history*. WIT Press, Southampton, pp. 3-31.
- Brunori, G. and Orsini, S. (2010). Food for the cities: urban policies and the role of farmers. In: Galli, M., Lardon, S., Marraccini, E. and Bonari, E. (Eds.). *Agricultural management in peri-urban areas: The experience of an international workshop*. Felici Editore, Ghezzano, pp. 45-52.

- Bryant, C.R. (1984). The Recent Evolution of Farming Landscapes in Urban-Centered Regions. *Landscape Planning* **11**(4): 307-326.
- Bryant, C.R. and Johnston, T.R.R. (1992). *Agriculture in the city's countryside*. Belhaven Press, London.
- Bryant, C.R., Rosswurm, L. and McLellan, A. (1982). *The City's Countryside: Land and its Management in the Rural Urban Fringe*. Longman, London.
- Buciega, A., Pitarch, M.D. and Esparcia, J. (2009). The Context of Rural–Urban Relationships in Finland, France, Hungary, The Netherlands and Spain. *Journal of Environmental Policy and Planning* **11**(1): 9-27.
- Busck, A.G., Pilgaard Kristensen, S., Praestholm, S. and Primdahl, J. (2008). Porous landscapes - The case of Greater Copenhagen. *Urban Forestry & Urban Greening* **7**(3): 145-156.
- Busck, A.G., Pilgaard Kristensen, S., Praestholm, S., Reenberg, A. and Primdahl, J. (2006). Land system changes in the context of urbanisation: Examples from the peri-urban area of Greater Copenhagen. *Geografisk tidsskrift-Dansish Journal of Geography* **106**(2): 21-34.
- Buyck, J., Chery, J.-P. and Jarrige, F. (2010). *Analysis of regional spatial planning and decision making strategies and their impact on land use in the urban fringe*. PLUREL Deliverable Report 3.3.2. Last retrieved January 18, 2012 from <http://www.plurel.net/images/D332.pdf>.
- Cavailles, J., Peeters, D., Sekeris, E. and Thisse, J.F. (2004). The Periurban city: Why to live between the suburbs and the countryside. *Regional Science and Urban Economics* **34**(6): 681-703.
- Cavailles, J. and Wavresky, P. (2003). Urban influences on periurban farmland prices. *European Review of Agricultural Economics* **30**(3): 333-357.
- CEMAT – Council of Europe Conference of Ministers Responsible for Spatial / Regional Planning (2007). *Spatial development glossary. Territory and landscape*, No. 2. Council of Europe Publishing, Strasbourg.
- CES (2004). *Opinion of the European Economic and Social Committee on Agriculture in peri-urban areas* European Economic and Social Committee, 2005/C 74/12.
- Champion, A.G., Fielding, A.J. and Keeble, D. (1989). Counterurbanization in Europe. *The Geographical Journal*, **155**(1): 52-80.
- Cicia, G., Colantouni, F., Del Giudice, T. and Pascucci, S. (2008). Towards a re-conceptualisation of farm types in the urban fringe: some empirical evidence from the Regional Park of "Campi Flegrei" in the metropolitan areas of Naples. In: Conference

Transitions towards sustainable agriculture, food chains and peri-urban areas. Wageningen, The Netherlands, 26-29 October 2008.

Clark, J.K., Jackson-Smith, D., Sharp, J.S. and Munroe, D.K. (2007). The Geography of US Peri-urban Agricultural Adaption. In *Conference on the Science and Education of Land Use: A transatlantic, multidisciplinary and comparative approach.* Washington DC, USA, 24-26 September 2007.

Cloke, P. and Goodwin, M. (1992). The changing function and position of rural areas in Europe. In: Huigen, P., Paul, L. and Volkers, K. (Eds.). *The changing function and position of rural areas in Europe.* Koninklijk Nederlands Aardrijkskundig Genootschap/Rijksuniversiteit Utrecht, Nederlandse geografische studies 153, pp. 19-36.

Clouth, H.D. (1998). The European countryside: contested space. In: Graham, B. (Ed.). *Modern Europe. Place, Culture and Identity.* Arnold, London, pp. 287-309.

COM – Commission of the European Communities (1999). *European Spatial Development Perspective. Towards Balanced and Sustainable Development of the Territory of the European Union.* Office for Official Publications of the European Communities, Luxembourg.

COM – European Community (2000). *Resolution on the reform of the common agricultural policy.* COM(97)2000, Official Journal C210, 06/07/1998, p. 19.

COM – Commission of the European Communities (2004). *Urban Audit – Methodological Handbook.* Office for Official Publications of the European Communities, Luxembourg.

COM – European Community (2005). *Council Regulation No 1698/2005 of 20 September 2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD),* Official Journal L277, 21/10/2005, p. 1–40.

COM – European Community (2006). *2006/144/EC: Council Decision (EC) of 20 February 2006 on Community strategic guidelines for rural development (programming period 2007 to 2013),* Official Journal L55, 25/02/2006, p. 20–29.

COM – Commission of the European Communities (2010). *The Common Agricultural Policy after 2013: Public debate Summary Report.* Commission of the European Communities, Brussels.

COM – Commission of the European Communities (2011). *Proposal for a regulation of the European Parliament and of the Council amending Council Regulation (EC) No 1698/2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD).* COM(2010)0537, C7-0295/10.

Couch, C., Leontidou, L. and Petschel-Held, G. (2007). *Urban sprawl in Europe – Landscapes, Land-use Change and Policy.* Blackwell, Oxford.

Dalgaard, T., Kjeldsen, C., Hutchings, N., Happe, K., Osuch, A., Damgaard, M., Zander, P. and Piorr, A. (2007). Multifunctional farming, multifunctional landscapes and rural development. In: Mander, Ü., Wiggering, H. and Helming, K. (Eds.). *Multifunctional Land Use. Meeting Future Demands for Landscape Goods and Services*. Springer, Berlin and Heidelberg, pp. 183-193.

Dewaelheyns, V. and Gulinck, H. (2008). Rurality near the city. Editorial Paper. In: Dewaelheyns, V. and Gulinck, H. (Eds.). *Proceedings of the international Conference and Workshops Rurality near the city*. Leuven, Belgium, 7-8 February 2008, pp. 5-22.

Dexter, K. (1977). The impact of technology on the political economy of agriculture. *Journal of Agricultural Economics* **28**(3): 211-219.

Di Iacovo, F. and O'Connor, D. (2009). *Supporting policies for Social Farming in Europe: Progressing Multifunctionality in Responsive Rural Areas*. Florence: Agenzia Regionale per lo Sviluppo e l'Innovazione nel settore Agricolo-forestale.

Diakosavvas, D. (2008). How far can agricultural policies contribute to achieving rural development objectives in semi-urban areas? In: Dewaelheyns, V. and Gulinck, H. (Eds.). *Proceedings of the international Conference and Workshops Rurality near the city*. Leuven, Belgium, 7-8 February 2008, pp. 23-32.

EEA (2006). *Urban Sprawl in Europe – The ignored challenge*. Report No. 10/2006. European Environment Agency (EEA), Copenhagen.

Elgåker, H. (2011). *Horse Keeping in Peri-urban Areas: Changing Land Use with Possibilities and Conflicts*. Dissertation. Swedish University of Agricultural Sciences, Alnarp.

EN RD (2011). *Thematic Working Group 1: Targeting territorial specificities and needs in Rural Development Programmes. Case Study on Rural Areas Eligible for Axis 3 Measures*. 17 February 2001. European Network Rural Development (EN RD) Contact Point.

Errington, A.J. (1994). The peri-urban fringe: Europe's forgotten rural areas. *Journal of Rural Studies* **10**(4): 367-375.

Esparcia, J. and Buciega, A. (2005). *New Rural - Urban Relationships in Europe: A Comparative Analysis. Experiences from The Netherlands, Spain, Hungary, Finland and France*. Universitat de València, Valencia.

ESPON (2005). *Urban-rural relations in Europe – ESPON 1.1.2 Final Report*. European Spatial Planning and Observation Network (ESPON), Luxembourg.

EUROSTAT (2010). *Regional Yearbook 2010*. EUROSTAT, Luxembourg.

- EUROSTAT (2012). Regional agriculture statistics database. Last retrieved January 18, 2012 from http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database.
- Evans, N.J. and Ilbery, B.W. (1993). The pluriactivity, part-time farming, and farm diversification debate. *Environment and Planning A* **25**(7): 945-959.
- Evans, N.J., Morris, C. and Winter, M. (2002). Conceptualizing agriculture: a critique of post-productivism as the new orthodoxy. *Progress in Human Geography* **26**(3): 313-332.
- FAO (2007). *Profitability and sustainability of urban and peri-urban agriculture*. Agricultural Management, Marketing and Finance Occasional Paper 19. Food and Agriculture Organisation of the United Nations (FAO), Rome.
- Statistisches Bundesamt (2007). *Strukturerhebung in landwirtschaftlichen Betrieben 2007*. Statistisches Bundesamt, Wiesbaden.
- Fielding, N. and Schreier, M. (2001). Introduction: On the Comparability between Qualitative and Quantitative Research Methods. *Forum Qualitative Social Research* **2**(1); Art. 4.
- Flick, U. (1998). Triangulation – Geltungsbegründung oder Erkenntniszuwachs. *Zeitschrift für Soziologie der Erziehung und Sozialisation* **18**: 443-447.
- Fry, G.L.A. (2001). Multifunctional landscapes – towards transdisciplinary research. *Landscape and Urban Planning* **57**(3-4): 159-168.
- Fuller, A. (1990). From part-time farming to pluriactivity. *Journal of Rural Studies* **6**(4): 361-373.
- Gallent, N. (2006). The rural-urban fringe: a new priority for planning policy? *Planning Practice & Research* **21**(3): 383-393.
- Gallent, N., Anderson, J. and Bianconi, M. (2006). *Planning on the edge: the context for planning at the rural-urban fringe*. Routledge, London and New York.
- Galli, M., Lardon, S., Marraccini, E. and Bonari, E. (2010). *Agricultural management in peri-urban areas: The experience of an international workshop*. Felici Editore, Ghezzano.
- Gant, R.L., Robinson, G.M. and Fazal, S. (2011). Land-use change in the 'edgelands': Policies and pressures in London's rural-urban fringe. *Land Use Policy* **28**(1): 266-279.
- Garnett, T. (2001). Urban Agriculture in London: Rethinking our Food Economy. In: Bakker, N., Dubbeling, M., Guendel, S., Sabel Koschella, U. and de Zeeuw, H. (Eds.).

Growing Cities Growing Food: Urban Agriculture on the Policy Agenda: A Reader on Urban Agriculture. DSE / Zentralstelle für Ernährung und Landwirtschaft, Feldafing, pp. 477-500.

Gilg, A. and Battershill, M. (1998). Quality farm food in Europe: a possible alternative to the industrialised food market and to current agri-environmental policies: lessons from France. *Food Policy* **23**(1): 25-40.

Griese, B. (2005). *Triangulation: Ein Forschungsmodell in der empirischen Sozialforschung*. Universität Mainz. Last retrieved January 18, 2012 from <http://www.uni-mainz.de/FB/Paedagogik/Erwachsenenbildung/triangulationonline.pdf>.

Guiomar, X. (2010). Peri-urban agriculture and local authorities: which policies for which proximities? Example of local policies in Ile de France. In: Galli, M., Lardon, S., Marraccini, E. and Bonari, E. (Eds.). *Agricultural management in peri-urban areas: The experience of an international workshop*. Felici Editore, Ghezano, pp. 29-44.

Gulinck, H. (2004). Neo-rurality and multifunctional landscapes. In: Brand, J. and Vejre, H. (Eds.). *Multifunctional landscapes – Volume I Theory, Values and History*. WIT Press, Southampton, pp. 63-73.

Halfacree, K.H. (1997). Contrasting roles for the post-productivist countryside: a postmodern perspective on counterurbanisation. In: Cloke, P. and Little, J. (Eds.). *Contested Countryside Cultures: Otherness, Marginalisation and Rurality*. Routledge, London and New York, pp. 70-91.

Hall, P. (1966). *Von Thunen's Isolated State: An English Edition of Der Isolierte Staat*. (transl. by Carla M. Wartenberg). Pergamon, Oxford.

Hansson, H., Ferguson, R. and Olofson, C. (2010). Understanding the diversification and specialization of farm businesses. *Agricultural and Food Science* **19**: 269-283.

Harris, C.C. and Allee, D.J. (1964). Problems on the Rural-Urban-Fringe. *California Agriculture* **18**(4): 8-9.

Harvey, M. and Pilgrim, S. (2011). The new competition for land: Food, energy, and climate change. *Food Policy* **36**(S1): S40-S51.

Heimlich, R.E. and Anderson, W.A. (2001). *Development at the Urban Fringe and Beyond: Impacts on Agriculture and Rural Land*. Agricultural Economic Report No. 803. U.S. Dept. of Agriculture, Economic Research Service, Washington, D.C.

Heimlich, R.E. and Barnard, C.H. (1997). Agricultural Adaption to Urbanization: Farm Types and Agricultural Sustainability in U.S. Metropolitan Areas. In: Audirac, I. (Ed.). *Rural Sustainability Development in America*. Wiley and Sons, New York, pp. 283-303.

- Heimlich, R.E. and Brooks, D.H. (1989). *Metropolitan growth and agriculture: Farming in the city's shadow*. U.S. Dept. of Agriculture, Economic Research Service, Washington, D.C.
- Herslund, L. and Fertner, C. (2010). Anti-urbanisation as development chance for rural areas. In-migration and self-employed business in the countryside around Copenhagen. In: *Conference Managing the Urban Rural Interface*. Copenhagen, Denmark, 19-22 October 2010.
- Hinrichs, C. (2003). The practice and politics of food system localization. *Journal of Rural Studies* **19**(1): 33-45.
- Hjalager, A.M. (1996). Agricultural diversification into tourism: Evidence of a European Community development programme. *Tourism Management* **17**(2): 103-111.
- Hofman, N. (2001). Urban Consumption of Agricultural Land. *Rural and Small Town Canada Analysis Bulletin* **3**(2): 1-13.
- Hoggart, K. (2005). City Hinterlands in European Space. In: Hoggart, K. (Ed.). *The city's hinterland: dynamism and divergence in Europe's peri-urban territories*. Ashgate, Aldershot, pp. 1-18.
- Ilbery, B.W. (1986). *Agricultural geography: A Social and Economic Analysis*. Oxford University Press, Oxford.
- Ilbery, B.W. (1987). The development of farm diversification in the UK: evidence from Birmingham's urban fringe. *Journal of the Royal Agricultural Society of England* **148**: 21-35.
- Ilbery, B.W. (1991). Farm diversification as an adjustment strategy on the urban fringe of the West Midlands. *Journal of Rural Studies* **7**(3): 207-218.
- Ilbery, B.W. and Bowler, I.R. (1998). From agricultural productivism to post-productivism. In: Ilbery, B. (Ed.). *The Geography of rural change*. Longman, Harlow, pp. 57-84.
- Ilbery, B.W., Healey, M. and Higginbottom, J. (1997). On and off-farm Business Diversification by Farm Households in England. In: Ilbery, B., Chiotti, Q. and Rickard, T. (Eds.). *Agricultural restructuring and sustainability: A geographical perspective*. CAB International, Wallingford, pp. 135-151.
- Ilbery, B.W., Holloway, L., and Arber, R. (1999). The Geography of Organic Farming in England and Wales in the 1990s. *Tijdschrift voor Economische en Sociale Geografie* **90**(3): 285-295.
- Le Jeannic, T. (1997). Trente ans de périurbanisation: extension et dilution des villes. *Economie et statistique* **307**: 21-41.

- Inwood, S.M. and Sharp, J.S. (2012). Farm persistence and adaptation at the rural-urban interface: Succession and farm adjustment. *Journal of Rural Studies* **28**(1): 107-117.
- Jongeneel, R.A., Polman, N.B.P. and Slangen, L.H.G. (2008). Why are Dutch farmers going multifunctional? *Land Use Policy* **25**(1): 81-94.
- Kerselaers, E., Rogge, E., Dessein, J., Lauwers, L. and van Huylenbroeck, G. (2011). Prioritising land to be preserved for agriculture: A context-specific value tree. *Land Use Policy* **28**(1): 219-226.
- Knickel, K. and Hof, S. (2002). Direct Retailing in Germany: Farmers Markets in Frankfurt. In: van der Ploeg, J.D., Long, A. and Banks, J. (Eds.). *Rural Development Process in Europe: The State of the Art*. Elsevier, Doetinchem, pp. 104-113.
- Knickel, K. and Renting, H. (2000). Methodological and Conceptual Issues in the Study of Multifunctionality and Rural Development. *Sociologia Ruralis* **40**(4): 512-528.
- Koomen, E., Dekkers, J. and van Dijk, T. (2008). Open-space preservation in the Netherlands: Planning, practice and prospects. *Land Use Policy* **25**(3): 361-377.
- Kristensen, L. (2001). Agricultural change in Denmark between 1982 and 1989: the appearance of post-productivism in farming? *Geografisk tidsskrift-Dansish Journal of Geography* **101**: 77-86.
- Krueger, R.R. (1978). Urbanization of the Niagara fruit belt. *Canadian Geographer* **22**(3): 179-194.
- Lange, A., Piorr, A., Siebert, R. and Zasada, I. (in press). Spatial differentiation of new target groups for farm diversification: How vicinity to cities and rural attractiveness determine farm households strategies for future CAP options. *Land Use Policy*.
- LDS (2006). *Gartenbauerhebung im Land Brandenburg 2005*. Potsdam: Landesbetrieb für Datenverarbeitung und Statistik (LDS).
- le Grand, L. and van Meekeren, M. (2008). Urban-rural relations: Dutch experiences of the Leader+ network and rural innovation in areas under strong urban influences. In: Dewaelheyns, V. and Gulinck, H. (Eds.). *Proceedings of the international Conference and Workshops Rurality near the city*. Leuven, Belgium, 7-8 February 2008, pp. 95-100.
- Leinfelder, H. (2009). Formalisation of "Open Space as Public Space" in Zoning: The Belgian Experience. In: van der Falk, A. and van Dijk, T. (Eds.). *Regional Planning for Open Space*. Routledge, London and New York, pp. 223-247.
- Lobley, M. and Potter, C. (2004). Agricultural change and restructuring: recent evidence from a survey of agricultural households in England. *Journal of Rural Studies* **20**(4): 499-510.

- Loureiro, M.L. and Hine, S.E. (2002). Discovering Niche Markets: A Comparison of Consumer Willingness to Pay for Local (Colorado Grown), Organic, and GMO-Free Products. *Journal of Agricultural and Applied Economics* **34**(3): 477-487.
- Luttik, J. and van der Ploeg, B. (2004). Functions of agriculture in urban society in the Netherlands. In: Brouwer, F. (Ed.). *Sustaining Agriculture and the rural Economy: Governance, Policy and Multifunctionality*. Edward Elgar, Cheltenham, pp. 204-222.
- Maier, L., Shobayashi, M. (2001). Multifunctionality: Towards an analytical framework. Organisation for Economic Co-operation and Development (OECD), Paris.
- Marsden, T. (1999). Rural Futures: The Consumption Countryside and its Regulation. *Sociologia Ruralis* **39**(4): 501-526.
- Marsden, T. (2003). *The Condition of Rural Sustainability*. van Gorcum, Assen.
- Marsden, T. and Smith, E. (2005). Ecological entrepreneurship: sustainable development in local communities through quality food production and local branding. *Geoforum* **36**(4): 440-451.
- Marsden, T. and Sonnino, R. (2008). Rural development and the regional state: Denying multifunctional agriculture in the UK. *Journal of Rural Studies* **24**(4): 422-431.
- Mattern, H. (1964). *Gras darf nicht mehr wachsen*. Ullstein, Frankfurt.
- Maye, D., Ilbery, B. and Watts, D. (2009). Farm diversification, tenancy and CAP reform: Results from a survey of tenant farmers in England. *Journal of Rural Studies* **25**(3): 333-342.
- Meert, H., van Huylenbroeck, G., Vernimmen, T., Bourgeois, M. and van Hecke, E. (2005). Farm household survival strategies and diversification on marginal farms. *Journal of Rural Studies* **21**(1): 81-97.
- Meeus, S. and Gulinck, H. (2008). Defining semi urban areas in landscape research. *Living Reviews in Landscape Research* **2**(3).
- MLUR (2002). *Gemeinsamer Landesentwicklungsplan für den engeren Verflechtungsraum Brandenburg-Berlin*. Ministerium für Landwirtschaft, Umweltschutz und Raumordnung Land Brandenburg (MLUR), Potsdam.
- MIL (2008). *Agrarbericht 2008*. Ministerium für Infrastruktur und Landwirtschaft Land Brandenburg (MIL), Potsdam.
- MIL (2010). *Agrarbericht 2010*. Ministerium für Infrastruktur und Landwirtschaft Land Brandenburg (MIL), Potsdam.

- Montasell, J. and Callau, S. (2008). The Baix Llobregat Agricultural Park (Barcelona): An instrument for preserving, developing and managing a periurban agricultural area. In: Dewaelheyns, V. and Gulinck, H. (Eds.). *Proceedings of the international Conference and Workshops Rurality near the city*. Leuven, Belgium, 7-8 February 2008, pp. 69-74.
- Munton, R. (1974). Farming on the Urban Fringe. In: Johnson, J.H. (Ed.). *Suburban Growth*. John Wiley, London, pp. 201-263.
- Munton, R. (2009). Rural land ownership in the United Kingdom: Changing patterns and future possibilities for land use. *Land Use Policy* **26**(S1): S54-S61.
- Nilsson, K., Pauleit, S., Bell, S., Aalbers, C. and Sick Nielsen, Th. (Eds.) (2012). *Peri-urban futures: Scenarios and models for land use change in Europe*. Springer, Berlin and Heidelberg.
- ODPM (2006). *A framework for City-Regions*. Office of the Deputy Prime Minister (ODPM), London.
- OECD (1979). *Agriculture in the planning and management of peri-urban areas. Volume 1: Synthesis*. Organisation for Economic Co-operation and Development (OECD), Paris.
- OECD (2007). *Regional Typology*. Organisation for Economic Co-operation and Development (OECD), Paris.
- Patton, M. (2002). *Qualitative research and evaluation methods*, 3rd ed. Sage, Thousand Oaks.
- Péron, J.Y. and Geoffriau, E. (2007). Characteristics and Sustainable Development of Peri-Urban Vegetable Production in Europe. In *International Horticultural Congress – IHC2006: International Symposium on Horticultural Plants in Urban and Peri-Urban Life*. Seoul, 13-19 August 2006.
- Pfeifer, C., Jongeneel, R.A., Sonneveld, M.P.W. and Stoorvogel, J.J. (2009). Landscape properties as drivers for farm diversification: A Dutch case study. *Land Use Policy* **26**(4): 1106-1115.
- Piesse, J. and Thirtle, C. (2009). Three bubbles and a panic: An explanatory review of recent food commodity price events. *Food Policy* **34**(2), 119-129.
- Piorr, A., Müller, K., Happe, K. and Uthes, S. (2007). Agricultural management issues of implementing multifunctionality: commodity and non-commodity production in the approach of the MEA-Scope project. In: Mander, Ü., Wiggering, H. and Helming, K. (Eds.). *Multifunctional Land Use: Meeting Future Demands for Landscape Goods and Services*. Springer, Berlin and Heidelberg, pp. 167-181.

- Piorr, A., Ravetz, J. and Tosics, I. (2011). *Peri-urbanisation in Europe: Towards a European Policy to Sustain Urban-Rural Futures. Synthesis Report*. University of Copenhagen / Academic Books Life Sciences, Frederiksberg.
- Præstholt, S. and Kristensen, S.P. (2007). Farmers as initiators and farms as attractors for non-agricultural economic activities in peri-urban areas in Denmark. *Geografisk tidsskrift-Dansish Journal of Geography* **107**(2): 13-27.
- Primdahl, J. (1999). Agricultural landscapes as places of production and for living in: owner's versus producer's decision making and the implications for planning. *Landscape and Urban Planning* **46**(1-3): 143-150.
- Pryor, R.J. (1968). Defining the rural-urban fringe. *Social Forces* **47**(2): 202-215.
- PURPLE – Peri-urban Regions Platform Europe. (2007). *PURPLE and the CAP Reform – position paper*. Final Version, 8 November 2007. Last retrieved January 18, 2012 from http://ec.europa.eu/agriculture/healthcheck/consultation/contributions/purple_en.pdf.
- Qviström, M. (2008). A waste of time? On spatial planning and 'wastelands' at the city edge of Malmö (Sweden). *Urban Forestry & Urban Greening* **7**(3): 157-169.
- Qviström, M. and Saltzman, K. (2008). Ambiguous Edgelands: Landscape studies beyond rural-urban divides and disciplinary trench-lines. *Urban Forestry & Urban Greening* **7**(3): 143-144.
- Regionalpark Barnimer Feldmark (2007). *Entwicklungskonzept Regionalpark Barnimer Feldmark 2020 – Brandenburger Teil*, Entwurf, Stand überarbeitete Fassung Juli 2007, Regionalpark Barnimer Feldmark e.V., Ahrensfelde.
- Renting, H., Rossing, W., Groot, J., van der Ploeg, J., Laurent, C., Perraud, D., Stobbelaar, D.J. and van Ittersum, M.K. (2009). Exploring multifunctional agriculture. A review of conceptual approaches and prospects for an integrative transitional framework. *Journal of Environmental Management* **90**(S2): S112-S123.
- Rettig, S. (1976). An investigation into the problem of urban fringe agriculture in a green belt situation. *Journal of Environmental Planning and Management* **19**(1-2): 50-74.
- Robinson, G.M. (2004). *Geographies of agriculture: globalisation, restructuring and sustainability*. Pearson Education Limited, Harlow.
- Rode, M., Brink, A., von Haaren, C. and Tessin, W. (2006). Naturschutzorientierte Entwicklung im suburbanen Bereich am Beispiel Hannover-Kronsberg. *Natur und Landschaft* **81**(3): 146-151.

Roep, D. (2002). Value of Quality and Region: The Waddengroup Foundation. In: van der Ploeg, J.D., Long, A. and Banks, J. (Eds.). *Rural Development Process in Europe: The State of the Art*. Elsevier, Doetinchem, pp. 87-102.

Rogge, E., Dessein, J. and Gulinck, H. (2011). Stakeholders perception of attitudes towards major landscape changes held by the public: The case of greenhouse clusters in Flanders. *Land Use Policy* **28**(1): 334-342.

Rosol, M. (2010). Public Participation in Post-Fordist Urban Green Space Governance: The Case of Community Gardens in Berlin. *International Journal of Urban and Regional Research* **34**(3): 548-563.

Russwurm, L.H. (1977). *The surroundings of our cities: problems and planning implications of urban fringe landscapes*. Community Planning Press, Ottawa.

Ryan, R.L. and Hansel Walker, J.T. (2004). Protecting and managing private farmland and public greenways in the urban fringe. *Landscape and Urban Planning* **68**(2-3): 183-198.

Salamon, S. (2006). The rural household as consumption site. In: Cloke, P., Marsden, T. and Mooney, P. (Eds.). *Handbook of Rural Studies*. SAGE Publications, London, pp. 330-343.

Scelsi, F. (2002). *Rapporto di gestione 2002. Parco Agricolo Sud Milano*. Milan, Italy: Parco Agricolo Sud Milano. Last retrieved January 18, 2012 from <http://www.comune.settala.mi.it/downloads/Piano%20di%20Gestione%20Parco%20Agricolo%20Sud%20Milano.pdf>.

Sharpley, R. and Vass, A. (2006). Tourism, farming and diversification: An attitudinal study. *Tourism Management* **27**(5): 1040-1052.

Shoard, M. (2002). Edgelands. In: Jenkins, J. (Ed.). *Remarking the Landscape: The Changing Face of Britain*. Profile Books, London, pp. 117-146.

Sieverts, T. (2003). *Cities Without Cities: Between Place and World, Space and Time, Town and Country*. Routledge, London and New York.

Sinclair, R. (1967). Von Thunen and urban sprawl. *Annals of the Association of American Geographers* **57**(1): 72-87.

Statistisches Bundesamt / Amt für Statistik Berlin Brandenburg (2007). *Agrarstrukturerhebung 2007*.

Loibl, W. and Köstl, M. (2008). *Report on a methodology to delineate RUR sub-regions*. PLUREL Deliverable Report 2.1.4.

- The Countryside Agency (2003). *The state and potential of agriculture in the urban fringe*. The Countryside Agency, London.
- The Countryside Agency (2004). *The Countryside In and Around Towns: A vision for connecting town and country in the pursuit of sustainable development*. The Countryside Agency, London.
- Thomas, F. (1996). Stadt, Land, Landwirtschaft. Verbindungen und Verhältnisse. In: TAURUS-Institut (Ed.). *Regionen im Aufbruch. Beiträge und Beispiele zur eigenständigen und nachhaltigen Regionalentwicklung*. TAURUS-Institut, Trier, pp. 135-146.
- Tobias, S., Nuesch, A., Nebel, R. and Guilmain, A. (2005). Suburbane Landwirtschaft oder Landschaftsmanagement? *Agrarforschung* **12**(7): 306-311.
- Turner, J. and Davies, W. (1995). Farm-based tourism and recreation in the United Kingdom. *Agricultural Progress* **70**: 21-43.
- UBA (2004). *Hintergrundpapier: Flächenverbrauch, ein Umweltproblem mit wirtschaftlichen Folgen*. Umweltbundesamt, Berlin.
- Urry, J. (1995). *Consuming Places*. Routledge, London and New York.
- van Berkel, D.B. and Verburg, P.H. (2010). Sensitising rural policy: Assessing spatial variation in rural development options for Europe. *Land Use Policy* **28**(3): 447-459.
- van den Vaart, J.H.P. (1991). Conversion of farmsteads: Hidden urbanisation or a changing rural system? In: van Oort, G.M.R.A. van den Berg, L., Groenendijk, J.G. and Kempers, A.H.H.M. (Eds.). *Limits to rural land use: proceedings of an international conference organized by the Commission on Changing Rural Systems of the International Geographical Union (IGU)*. Pudoc, Wageningen, The Netherlands, pp. 123-129.
- van der Ploeg, J.D. (1994). Styles of farming: an introductory note on concepts and methodology. In: van der Ploeg, J.D. and Long, A. (Eds.). *Born from within: practice and perspectives of endogenous rural development*. van Gorcum, Assen, pp. 7-30.
- van der Ploeg, J.D. (2003). *The Virtual Farmer: past, present and future of the Dutch peasantry*. van Gorcum, Assen.
- van der Ploeg, J.D. (2010). Farming Styles Research: The State of the Art. In: *Workshop on 'Historicising Farming Styles'*. Melk, Austria, 22-23 October 2010.
- van der Ploeg, J.D., Laurent, C., Blondeau, F. and Bonnafous, P. (2009). Farm diversity, classification schemes and multifunctionality. *Journal of Environmental Management* **90**(S2): S124-S131.

- van der Ploeg, J.D., Long, A. and Banks, J. (2002). Rural development: The state of the art. In: van der Ploeg, J.D., Long, A. and Banks, J. (Eds.). *Living Countrysides. Rural development processes in Europe: the state of the art*. Elsevier, Doetinchen, pp. 8-17.
- van Huylenbroeck, G., van Hecke, E., Meert, H., Vandermeulen, V., Verspecht, A., Vernimmen, T., Boulanger, A. and Luyten, S. (2005). *Development strategies for a multifunctional agriculture in peri-urban areas – Summary*. Belgian Science Policy, Brussels. Last retrieved January 18, 2012 from http://www.belspo.be/belspo/organisation/Publ/pub_ostc/CPagr/rappCP18r_en.pdf
- Vandermeulen, V., Verspecht, A. and van Huylenbroeck, G. (2005). Perception of Land Scarcity by Peri-Urban Farmers. In *11th Congress of the EAAE 'The Future of Rural Europe in the Global Agri-Food System'*. Copenhagen, Denmark, 23-27 August 2005.
- Vejre, H., Primdahl, J. and Brandt, J. (2007). The Copenhagen Finger Plan: Keeping a green space structure by a simple planning metaphor. In: Pedroli, B., van Doorn, A., De Blust, G., Paracchini, M.L., Wascher, D. and Bunce, F. (Eds.). *Europe's living landscapes: Essays on exploring our identity in the countryside*. KNNV Publishing, Zeist, pp. 311-328.
- Vandermeulen, V., Verspecht, A., Huylenbroeck, G., Meert, H., Boulanger, A. and van Hecke, E. (2006). The importance of the institutional environment for the multifunctionality of the agriculture in the peri-urban area of Brussels. *Land Use Policy* 23(4): 486-501.
- Verspecht, A., Vandermeulen, V. and van Huylenbroeck, G. (2005). *Multifunctional agriculture in urbanized regions: characteristics of farmers in the fringe of Brussels*. Ghent: Ghent University. Last retrieved January 18, 2012 from <http://diba.cat/parcsn/parcs/life/pdfs/GuidoVanHuylenbroeck.pdf>
- von Haaren, C. and Reich, M. (2006). The German way to greenways and habitat networks. *Landscape and Urban Planning* 76(1-4): 7-22.
- Waltert, F. and Schläpfer, F. (2010). Landscape amenities and local development: A review of migration, regional economic and hedonic pricing studies. *Ecological economics* 70(2): 141-152.
- Wandel, M. and Bugge, A. (1997). Environmental concern in consumer evaluation of food quality. *Food Quality and Preference* 8(1): 19-26.
- Wehrwein, G. (1942). The Rural-Urban Fringe. *Economic Geography* 18(3): 217-228.
- Wiggering, H., Mueller, K., Werner, A. and Helming, K. (2003): The concept of multifunctionality in sustainable land development. In: Helming, K. and Wiggering, H.

(Eds.). *Sustainable Development of Multifunctional Landscapes*. Springer, Berlin and Heidelberg, pp. 3-18.

Wilson, G. (2007). 'Post-productivism' or 'non-productivism'? In: Wilson, G. (Ed.). *Multifunctional agriculture: a transition theory perspective*. CAB International, Wallingford.

Wilson, G. (2008). From 'weak' to 'strong' multifunctionality: conceptualising farm-level multifunctional transitional pathways. *Journal of Rural Studies* **24**(3): 367-383.

Wilson, N. (1996). The supply chains of perishable products in northern Europe. *British Food Journal* **98**(6): 9-15.

Zasada, I., Alves, S., Müller, F.C., Piorr, A., Berges, R. and Bell, S. (2010). International retirement migration in the Alicante region, Spain: process, spatial pattern and environmental impacts. *Journal of Environmental Planning and Management* **53**(1): 125-141.

Zasada, I., Loibl, W., Berges, R., Piorr, A. and Werner, A. (in press). Rural-Urban-Regions – A spatial approach to trace urban-rural relationships in Europe. In: Pauleit, S., Bell, S., Aalbers, C., Nielsen, T.A.S. and Nielsson, K. (Eds.). *Peri-urban futures: land use and sustainability*. Springer, Berlin and Heidelberg.

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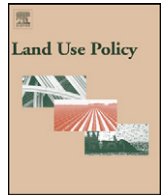
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Annex: Research Papers

Paper I

Zasada, I. (2011). Multifunctional peri-urban agriculture – A Review of societal demands and the provision of goods and services by farming. *Land Use Policy* **28**(4): 639-648.



Review

Multifunctional peri-urban agriculture—A review of societal demands and the provision of goods and services by farming

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ABSTRACT

Peri-urban areas around urban agglomerations in Europe and elsewhere have been subject to agricultural and land use research for the past three decades. The manner in which farming responds to urban pressures, socio-economic changes and development opportunities has been the main focus of examination, with urban demand for rural goods and services representing a driving factor to adapt farming activities in a multifunctional way. Working within the peri-urban framework, this review pays particular attention to the relevance of multifunctional agriculture. Academic discourses and empirical insights related to farm structure and practices beyond conventional agriculture are analysed. Diversification, recreational and environmental farming, landscape management and specialisation, as well as direct marketing are all taken into consideration and discussed within the context of landscape functions. The provision of rural goods and services is contrasted with societal demands on peri-urban agriculture. This review finds that multifunctional agriculture has been commonly recognised in peri-urban areas – a phenomenon that includes a large variety of activities and diversification approaches within the context of environmental, social and economic functions of agriculture. In response to the post-productive, consumption-oriented requirements of the urban society, peri-urban farmers have intensified their uptake of multifunctional activities. Nevertheless, not all multifunctional opportunities are being fully developed when one considers the large and growing urban demand for goods and services provided by agriculture carried out near the city. This paper discusses policy and planning approaches to support multifunctional agriculture in peri-urban areas.

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Introduction

Peri-urban agriculture

Western Europe, among other parts of the world, has experienced a rapid process of urbanisation beyond former city limits over the past few decades. This development comprises physical conversion of open, non-built areas for settlement purposes (EEA, 2006; Thomas et al., 2008) as well as socio-cultural transitions such as the adoption of urban life styles by the rural population, the in-migration of retirees into rural areas neighbouring urban agglomerations, or changes in business structures (Antrop, 2004; Bergstrom, 2005; Busck et al., 2006; Zasada et al., 2010). Although urban growth increasingly takes place on brownfield and infill sites, the conversion of non-built-up areas has occurred almost exclusively at the expense of farmland (Munton, 2009). Productive land and fertile soils are therefore lost, and the number of farms decreases (EEA, 2006; Poppe et al., 2005).

In peri-urban areas, farming has to compete on the land market with other non-agricultural land uses, such as housing with its higher bid rents (Robinson, 2004). As the price for a piece of farmland with an associated building permit rises dramatically, there is a strong financial incentive for farmers to sell land for purposes of urban development. Land speculation is accompanied by expanding shares of non-agricultural owners and common land tenure by producers (Gant et al., 2011). From observations in the UK between 1996 and 2002, Munton (2009) recognised a strong urban impact on the agricultural land market. Land prices rose overproportionally for attractive and accessible land with dwellings. He notes that in the direct urban fringe, there exists various market conditions with much higher land prices, along with a fragmented and complex pattern of ownership and property rights, such as short-term contracts. Aggravating the situation are those shadow markets that form around the expected housing development permissions, which is a development that in turn challenges the traditional landlord-tenant system (Munton, 2009). This increases the influence of the heterogeneous group of land owners who are not farmers of the land they use, as Primdahl (1999) notes.

At the fringes of cities and agglomerations, the high degree of land use transition and conversion for urban purposes as well as the existence of idle and marginal open spaces result in a complex and chaotic mix of heterogeneous land uses, which is how Shoard (2002) characterised the “edgelands” in the UK. In such a landscape, agriculture is exposed to numerous additional pressures and tensions. There is a major build up of litter, wrecks and household waste, even if such refuse is dumped legally (Shoard, 2002; Qvistrom, 2008). Farming is additionally constrained through the fragmentation of infrastructure, trespassing, widespread vandalism and theft (Catherine Bickmore Associates, 2003) as well as legal issues, such as emission thresholds (Verspecht et al., 2005).

Although marginalised, the delivery of environmental and recreational values by peri-urban agriculture (PUA) has gained importance with the rise of the post-fordist society. Many scholars

argue that traditional agricultural functions and values have noticeably been replaced by new non- or post-productive ones, adding a consumption-oriented component to a formerly production-oriented agriculture (Marsden, 1999; Brandt and Vejre, 2004; Luttkik and van der Ploeg, 2004). Due to the proximity to urban centres as nuclei of societal and lifestyle transitions, this process provides an opportunity to restructure farming beyond the industrial model based on pure commodity production. Increased standards of living and extended leisure time of urbanites are mirrored by a tendency to purchase regional organic food, spend leisure time in the near countryside, or even to permanently settle down in the countryside around towns. Recreational opportunities, attractive living environments and ecological quality represent soft locational factors, which gain relevance within the international competition of urban regions. Therefore commentators, such as Weber and Seher (2006), argue that multifunctional oriented PUA plays an important role for their provision. A tremendous pressure to adjust agriculture to the modified peri-urban framework conditions has been observed (van Huylenbroeck et al., 2005; Busck et al., 2008). As a result, PUA has been identified as being more diversified, polarised and multifaceted than elsewhere, stressing that this organisation of production contributes to the viability and persistence of agriculture and its societal esteem.

Objectives and methodology

This literature review provides a comprehensive overview and analysis of the existing academic discussion and empirical insights from various peri-urban regions. Going beyond simple examinations on findings of multifunctional farming practices, it methodologically relates them to urban-centred societal valuation and appreciation for agricultural goods and services. Under the premise that the concept of multifunctional agriculture is based on the integrated provision of different goods and services, relevant literature is arranged in groups of functions and services, which are provided by the agricultural landscape and represent the economic, social and environmental dimensions of sustainability.

The following section introduces the theoretical framework for the concept of multifunctionality and how it is applied to peri-urban areas. Sections three and four cover more detailed investigations into multifunctional PUA, focusing on values and functions of landscape, such as environment and landscape, recreational and social issues, short supply chains and direct marketing. Existing research is balanced with results from research on actual urban demands and preferences. This procedure has been chosen to address research questions such as the following: to what extent is multifunctionality a property of PUA? How well do provided goods and services from multifunctional agriculture match urban demands? And finally; which factors and framework conditions enhance or constrain the diversification of farming activities? The last section discusses the relevance and contribution of multifunctional agriculture for sustainable development in peri-urban areas,

as well as the role and requirements of preservation, supporting policy and planning instruments.

Methodologically, the review is based on an iteratively structured literature survey through the internet databases of 'ScienceDirect', 'ISI Web of Knowledge' and 'Google Scholar'. Combinations of key words related to peri-urban areas; i.e. "urban fringe"; "sprawl"; "urbanisation" and multifunctionality; i.e. "diversification"; "farm tourism"; "landscape management"; have been used for the literature search. Further sources have been found by browsing through more general multifunctionality literature; which also refer to peri-urban areas. The review contains sources on both the theoretical and conceptual background and empirical insights into multifunctional peri-urban farming practices. These include comprehensive statistical analyses and in-depth regional case studies that have been carried out over longer periods of time. The spatial scope of the literature has been geographically limited to research within the European context.

Multifunctional agriculture in peri-urban areas

Driven by output-related subsidies, the European rural countryside in the second half of the 20th century was characterised by mono-functional and intensive production-oriented agriculture. Urban pressures on agriculture and prevalent development potentials presented the main reasons to adapt farming. The multifunctionality paradigm in particular represented a suitable pathway to the development of peri-urban agriculture. As a general definition, and based on the paradigm of sustainable development, the concept has been developed as a framework for rural development to enable agriculture to cope with post-productive challenges (Wiggering et al., 2003). It aims at spatial and temporal integration of land uses and functions beyond traditional food production, with such uses including aesthetical and recreational values, nature conservation or hydrological balance. Enabling the co-existence of different types of land use in a close spatial context, multifunctionality is characterised by synergies, jointness, and a mitigation of conflict situations (Brandt and Vejre, 2004; Gulinc, 2004). Multifunctional agriculture encompasses various strategies and activity fields for farms, such as diversification on and off the farm, specialisation in production and processing, direct marketing or measures in nature and landscape management. Different explanatory approaches have been put forward to analyse multifunctional transitions at farm level. van der Ploeg et al. (2002) focus on rural development trajectories. They distinguish deepening, broadening and re-grounding, depending on whether more value is added per unit, additional activities are started, or more resources are mobilised. Wilson (2007) reflects on multifunctionality as transition processes, whereas Meert et al. (2005) see multifunctional approaches as a farm survival strategy.

Multifunctionality has become a buzzword in research and policy. Wilson (2007) criticises that it suffers from a rather diverse and fuzzy conceptualisation, depending on the field of research, stretching from rural sociology and agricultural economics to geography. Noteworthy is the distinction between multifunctionality from a broader landscape and ecology perspective (Brandt and Vejre, 2004) and the notion of multifunctional agriculture (van Huylenbroeck et al., 2007; Wilson, 2007), which represents the theoretical background for this review. Wilson (2007) distinguishes between more narrow-sensed economic or policy-based discourses and broader holistic interpretations: the first group draws upon agriculture as economic activity, jointly producing commodity and non-commodity outputs as well as the regulatory framework for a multifunctional pathway. Interlinkages to socio-cultural processes and rural development are reflected by the latter.

This idea of linking the positive, supply side and the normative demand side has been described by van Huylenbroeck et al. (2007) as a locally embedded model of agriculture. As it set urban demand and rural supply into a close spatial context, this model attains particular relevancy for peri-urban areas.

During the agricultural crisis of the 1980s, diversification had already been observed in PUA as a survival strategy in rural areas (Ilbery, 1987; Bryant and Johnston, 1992). More recently, in the course of a more comprehensive discussion on multifunctional rural development (van Huylenbroeck et al., 2007; Piorr and Müller, 2009), peri-urban areas have also been subject to multifunctionality research. Nevertheless, the specifics of PUA have not yet received much attention. Only a few research initiatives on a national level (Catherine Bickmore Associates, 2003; van Huylenbroeck et al., 2005; Allaert et al., 2006) have brought the topic onto the academic agenda. However, it has been acknowledged that a multifunctional PUA requires specific attention, since its structures, processes and particularly the interplay with the urban area are not yet fully understood. Allaert et al. (2006: 5) concluded that "if agriculture wants to have a reason for existence in an urbanised society, agriculture no longer can and may be considered as an economic activity *sensu stricto*." Wilson also points out that elements necessary for what he calls "strong multifunctionality" are particularly evident in peri-urban areas, such as strong non-productivist tendencies including local embeddedness, short supply chains, low farming intensity, a high degree of diversification, and open-minded societies (Wilson, 2007).

Demands and preferences for multiple goods and services

Environmental quality and cultural landscapes

Due to its large spatial extent, agriculture plays a key role in managing the peri-urban landscape and the social, aesthetic and environmental functions of urban agglomerations nearby (Davoudi and Stead, 2007). Depending on the type and intensity of the farming practise, agriculture provides abiotic resources and ecosystem functions for the nearby urban areas. With its high water infiltration rates, pasture and arable land possess capacities for groundwater replenishment (Haase and Nuissl, 2007) and flood control (Kenyon et al., 2008; Wheeler and Evans, 2009). Along with forest and wetlands, farmland also contributes to the moderation of urban climate (Lamprey et al., 2005) and carbon sequestration (Freibauer et al., 2004; Hutchinson et al., 2007).

However, the agricultural countryside is also appreciated by society from a visual amenity perspective, as indicated by economic valuation methods such as contingent valuation, choice experiments or willingness-to-pay techniques. In their review, Hall et al. (2004) found that agriculture is recognised as an integral part of the cultural landscape in densely urbanised areas. Bouraoui (2005) could reveal in his studies that agriculture in the eyes of urban beholders represents a supportive element for the countryside's image and surrounding landscape. But along with a general appreciation of agricultural land use, other studies have concluded with a more differentiated picture. Therefore, according to the empirical evidence provided by Fleury (2002) and Buijs et al. (2006), the view of urban visitors on agricultural landscapes has changed from a functional-productive to a hedonic-aesthetic one over the last few decades. Other commentators, such as Thomas (1996) as well as Rode and von Haaren (2005) argue that a homogeneously structured and intensively used agriculture does not represent the societal ideal of PUA. Applying visual landscape valuation techniques in Mediterranean case studies, Kaplan et al. (2006) and Arriaza et al. (2004) found that rather heterogeneous and complex

agricultural land use and cropping patterns with small farms and a high degree of unaltered nature contributes to the amenity value of the agricultural countryside. Also [Matsuoka and Kaplan \(2008\)](#) recognised, in their review of people's needs in the urban landscape, that questioned individuals greatly prefer urban landscapes that are dominated by naturalistic features and elements. Particularly organic farming is highly appreciated by urban residents, as argued by [Brink \(2003\)](#). Surveys among German and Italian urban visitors of peri-urban agricultural landscapes revealed that measures of landscape management, such as hedges and tree rows, afforestation and path networks, were all positively acknowledged ([Rode and von Haaren, 2005](#)), whereas the implementation of environmental protection in terms of soil conservation and maintenance of biodiversity was much less valued in another case study ([Torquati et al., 2008](#)).

Although there is generally a high appreciation of farmland in the countryside around towns, the visual aspects of the agricultural countryside are prioritised. Its ecological value is less recognised among the public. The urban population prefers landscape amenities derived from a heterogeneous and small-scale farm structure punctuated with natural elements. Although its perception has been transformed lately, agriculture continually represents a major part of the cultural landscape in urbanised areas. However, there is an acceptance of agriculture as an integral land use actor in the peri-urban area. For instance, [Bills and Gross \(2005\)](#) found a high willingness among stakeholders in the agricultural surroundings of London to preserve crop and livestock agriculture as an element in the productive use of landscape, and thus maintain landscape diversity. Similarly, in the Brussels metropolitan region, more than half of the population support the protection of agricultural land use in the peri-urban fringe ([Boulanger et al., 2004](#)).

Leisure and recreation

With increasing leisure time, urban dwellers use their surrounding countryside for a multitude of activities. Outdoor recreation has become important for health and quality of life in an urbanised environment ([Bell et al., 2007](#)). It contributes to the reconnection of urban population to “the real-world qualities and thus to their own humane essence” as [Pedroli et al. \(2007: 434\)](#) put it. In their review on health effects of visible landscapes, [Velarde et al. \(2007\)](#) conclude that natural landscapes generally have more positive health effects than urbanised ones. Recreational activities require easy access for the potential user. Hence, [Antrop \(2004\)](#) argued that due to their absence in urban centres, in peri-urban surroundings and open spaces, agricultural areas gain importance as leisure areas. Similarly, [de Vries et al. \(2003\)](#) pointed out that the role of agricultural areas for recreation and public health is particularly relevant in highly urbanised regions. Even if agricultural production represents the dominating land use in the peri-urban area, it still provides a “breathing space” for the city nearby ([Bryant and Johnston, 1992](#)). In their case study in Northeast England, [Sharpley and Vass \(2006\)](#) confirmed that a demand for touristic attraction existed, as assessed by a high number of day visits in rural areas near urban agglomerations. A survey on urban dwellers in the Brussels region however has shown that only a minority of 24% take advantage of recreation-oriented diversification measures ([Boulanger et al., 2004](#)). More commonly, visitors from nearby urban areas use the peri-urban landscape in an informal way by enjoying open space activities. As [Agger \(2001\)](#) argues, agriculture particularly enables activities, such as walking and hunting, although these are not directly provided for on-farm. A strong argumentation provided in the literature at hand is that peri-urban farmland possesses recreational values, which are appreciated by urban dwellers. Recreation and leisure opportunities that contribute to the quality of life are

gaining importance. As inner cores of urban regions reach their limitations in complying with the increasing demand in green urban areas, the open spaces around cities, including the farmland, provide valuable potentials to deliver these services and functions.

Regional food supply

Despite the recent orientation away from traditional agriculture, food production remains an important function of PUA. It has been observed that consumers increasingly prefer regional production, particularly for high quality and natural products such as vegetable or ornamental crops ([Gilg and Battershill, 1998](#)). Depending on consumer groups and distance to the city, a relevant urban demand has been identified in empirical studies ([van Huylenbroeck et al., 2005](#)). [Boulanger et al. \(2004\)](#) found that between 14% of the inner city dwellers of Brussels and 59% of the residents in the peri-urban surrounding have at least once undertaken some kind of direct purchase of regionally produced food, such as from farmers' markets or farm gate purchases. Investigating rural areas in various metropolitan regions, [Buciega et al. \(2009\)](#) associate these reinforced urban–rural relationships with increasing interest of urban consumers in regional agriculture. Similarly, [Renting et al. \(2003\)](#) argue that short supply chains and direct interaction of actors involved in production, processing and distribution also play a significant role in the rural development and diversification process through synergy effects with agri-tourism, natural and landscape management. The locational necessity of agricultural production, namely in its proximity to the central city as described in the classical model by [Von Thünen \(1826\)](#), is experiencing a renaissance with a focus on specialised and high-value products.

Multifunctional farming activities

Landscape management and agri-environmental production

Through its complex interlinkages with landscape, agriculture plays an important role in the production of rural public goods through landscape management. In Europe, farmers are encouraged under agri-environmental schemes (AES) to adopt landscape management practices and environmentally friendly farming procedures that comply with Good Agricultural and Environmental Condition standards. Programmatic priority setting is left to the member countries and differs considerably ([Daniel and Perraud, 2009](#)). In general, AES compensate farmers for the deliverance of public goods related to landscape and biodiversity. Farming practices that promote visual amenities, biodiversity, soil and water protection, such as organic farming or extensive grassland management are supported ([Cooper et al., 2009](#)). From a peri-urban perspective, AES have been studied and discussed, focussing on the preference of measure adoption, the extent of implementation and the relationships to farming structure. [van Huylenbroeck et al. \(2005\)](#) found in the Brussels urban fringe that landscape management practices are commonly implemented, although farmers' participation rates are higher as their farms' distance to the city increases. In their case study, roughly 23% of farms are involved in some agri-environmental measures, whereas more than 60% participate in landscape measures, such as planting hedges and tree rows. The authors associate the results with land suitability and availability differences. AES in the different countries often aim at broad reach and coverage of farmland ([Cooper et al., 2009](#)). Extensive pasture areas, field margins or abandoned land, as well as areas suitable for landscape measures are more common in remote rural areas. Eligibility criteria, such as private ownership, minimum farm

size and contract duration of the particular measure present other constraining conditions for AES in PUA.

Direct economic benefits are not a major driver for adoption of AES in the PUA. Compensation payments remain marginal when compared to income from food production. However, in the Green Heart area inside the Dutch Randstad metropolitan region for example, 19% of dairy farms are involved in nature management measures, which is a significantly higher number than in the rest of the county (9%) as assessed by Luttik and van der Ploeg (2004). Comparing municipalities across Switzerland, Tobias et al. (2005) also found significantly higher rates for participation in ecological compensation measures among farms near urban agglomerations. Depending on the measure – hedgerow, greenery or pond improvement – up to 23% of landowners in peri-urban Copenhagen are involved in landscape management activities (Busck et al., 2006). Similar to the Dutch case, the authors determined that landowners consider income-related motivation to be less important than nature conservation and provision of recreational opportunities, such as hunting areas. The institutional framework of local and regional policies has been put forward as an important factor to encouragement farmers to participate in environmental programmes or other forms of diversification (Vandermeulen et al., 2006). They conclude that municipal engagement in promotion and support for agri-environmental or landscape measures influences farm behaviour. Others suggest that the dominating farm type affects participation rates in environmental and landscape measures. Part-time (Tobias et al., 2005), lifestyle-oriented (Busck et al., 2006), or innovative and adaptive farmers (van Huylenbroeck et al., 2005) tend to be more active in extensive farming and landscape management practices. Traditional farmers seem to follow a rather conservative strategy that avoids engagement in environmentally oriented practices (van Huylenbroeck et al., 2005). However, knowledge gaps e.g. among holdings that only generate a lower share of income from agriculture, have been identified as general barriers for adoption of AES (Præstholm et al., 2006).

Organic farming represents another approach to environmental oriented farming, which plays a significant role in PUA. Ilbery et al. (1999) found organic production concentrated in urban agglomerations in the UK, whereas in Switzerland it remained a phenomenon of the rural area (Tobias et al., 2005). Especially in the case of mountainous areas, the entry threshold to transform production from traditional to organic farming is comparably low, as management practices require only little changes. There, organic farming is carried out as extensive production, particularly in livestock farming. The authors concluded that such advantageous framework conditions take less effect in urbanised areas. Prevailing natural conditions additionally influence the occurrence of organic farming. Tobias et al. (2005) and Piorr et al. (2006) have shown that it represents a common farming scheme in areas of low soil fertility.

Although landscape management and organic farming have been subject of research in peri-urban areas, the analysed literature above provides only little and inconsistent evidence that farmers in peri-urban locations are more encouraged to participate in environmental and landscape management practices than elsewhere. Both are not a particular property of PUA, but rather are influenced by region. Natural conditions, farm size and structure have been identified as influencing factors for participation. The availability and suitability of the farmland for extensive production can be seen as main obstacles. It is noteworthy that agri-environmental payments are granted on the conditionality of a minimum farm size and land ownership conditions. Farmland is excluded if more than 25% belongs to public authorities. Also, behavioural differences related to farm sizes and farm types need to be taken into consideration. Large holdings, which are rather absent in PUA, possess the necessary farmland capacities to carry out extensive

production schemes. Knowledge gaps and administrative transaction costs often hinder participation for small holders. There are numerous obstacles, indicating that AES are not tailored for holdings prevalent in PUA, and instead tend to be part of development and economic viability of remote rural areas. What should be seen as particularly critical, when viewed in light of the urban preference for an amenity-rich farmland, is that PUA is characterised by an underproduction of environmental values and landscape elements.

Lifestyle farming

Lifestyle farming, among which hobby farming is a well-known type, emerged as a result of newcomers of urban origin who purchased farms and discovered the peri-urban agricultural area as a leisure space. The process brings about socio-economic changes among farm-holders and farm structures, i.e. through a withdrawal of crop and livestock production as an economic basis for agriculture. While farmers are either retired or employed elsewhere off-farm, economic production is rarely maintained and strategic decisions neglect economic aspects. They are also limited in durability and stability. A longitudinal study over two decades in the peri-urban area of Copenhagen focussed on socio-economic and agricultural land use transitions, confirming phenomena such as part-time, hobby and retirement farming (Præstholm and Kristensen, 2007; Busck et al., 2008). It showed that full-time farming decreased considerably from 26% to 8% between 1984 and 2003, whereas other farming styles grew according, transforming agricultural land from a production asset to a consumption good as Primdahl (1999) concludes. In contrast, Verspecht et al. (2005) found that in the Brussels region, almost 68% of the farmers are still considered as full-time farmers. However leisure and recreational farming already represent important elements of farming activity in peri-urban areas. Perceived as a recreational activity, production outputs and income generation remain marginal. It has been shown that lifestyle farmers tend to participate more in agri-environmental measures than average farmers (Præstholm et al., 2006). Although it does not represent a much diversified type, recreational farming contributes to farm-diversity on a regional level to which the provision and attraction of additional environmental and recreational functions of landscape are associated.

Recreation-oriented diversification

Farm-based tourism in terms of accommodation and recreational services has been recognised as a major diversification and farm survival strategy that contributes to rural re-vitalisation and development in both rural and peri-urban areas. By providing economic benefits through on-farm activities, or by making use of redundant buildings, it helps to keep farm land in operation (Che, 2007). Using the example of corn labyrinths in German PUA, Lohrberg (2001) highlights the role of innovative diversification to agri-tourism. Although most of the research at hand was conducted within a rural context, some empirical evidence from peri-urban areas confirms that a large share of all diversification measures is related to tourism (Ilbery, 1987; Sharpley and Vass, 2006). For example Jongeneel et al. (2008) found that among other factors, the location in the densely urbanised part of the Netherlands has a significant influence on participation in activities related to tourism. However, farm-based tourism does not represent an intrinsic characteristic of PUA. In general, its prevalence is limited to more rural areas. It is more geographically biased, since it requires the availability of natural amenities, i.e. mountains, forests or water areas. The diversification into farm-tourism and other recreational activities represents a suitable and common opportunity to make use of synergy effects within agri-environmental and

landscape management measures. Portraying prototypical Dutch farms, Swagemakers and Wiskerke (2004) could show how farms benefit from financial subsidies for agri-environmental measures, in that, once rural amenities and environmental quality have been improved, farm accommodation and direct marketing activities were facilitated.

Horse-keeping represents another example for a major farm diversification activity in peri-urban areas. Empirical case studies from Scotland, Canada and Sweden reveal high increases in stocking-rate gradients in urbanised or urban-rural regions (Quetier and Gordon, 2003; Elgaker and Wilton, 2008). Horse-related landscape transitions referred to as “horsification”, which are characterised by changing grazing practices or the dispersion of equine services and bridleways, are rather controversially discussed. For example, some authors focus on the negative impacts from the accommodation facilities and the neighbourhood conflicts with residents (Ravenscroft and Long, 1994; Elgaker and Wilton, 2008). For the equine business, local planners and officials increasingly recognise these issues, and have highlighted the need for integration within a wider discussion of rural development and its impacts on landscape (Bills and Gross, 2005). Other authors like Bailey et al. (2000) have demonstrated that due to the large and increasing demand from urban areas, the provision of equine services represents a relevant income source for peri-urban farmers and a serious land use alternative to conventional commodity production. Elgaker and Wilton (2008) also highlight the particular multifunctional character of horse-keeping, since it provides jointness and synergy effects with other economic and socio-cultural aspects, such as employment or recreational supply. Increasing recognition of PUA as a leisure and recreational space creates demand-conditions for public goods, i.e. amenity landscapes as well as for marketable agricultural commodities. In summary, recreation-oriented diversification opportunities contribute to the economic development process of the countryside near urban centres.

Social farming

Encompassing ideas such as farming for health, green care or care farming, social farming (SF) represents another example of multifunctional PUA. The main idea behind the concept of social farming is the integration of social and health care services into the agricultural activity. The social responsibility of agriculture is strengthened through the provision of different kinds of educational, social and caring functions, as Di Iacovo (2003) defines it. Therefore, production processes are redesigned to include activities like rehabilitation, therapy and education for people with physical and mental disabilities, the socially disadvantaged, children and seniors via their participation in farm-work activities (van Elsen, 2010). Although it is not supported by spatial distribution figures, it has been argued by Siebert et al. (2009) that social farming undertakes valuable social functions, particularly in the proximity to urban agglomerations with their associated density of disadvantaged groups. In contrast, where remoteness represents an inherent part of the therapeutic concept, SF is not exclusively a property of PUA (Di Iacovo and O'Connor, 2009). The first initiatives were established in the 1960s, although the extent of the phenomenon has seen a significant increase relatively recently. It now belongs to the fastest growing means of multifunctional agriculture in Europe (Hassink et al., 2007).

Short supply chains and direct marketing

In the 1970s, farmers did not consider the marketing and sales benefits of being located in the urban proximity (Rettig,

1976). Improved accessibility to local markets, the establishment of alternative or short supply chains and community supported agriculture has been reported more recently in peri-urban farming (Aubry et al., 2008; Jarosz, 2008). The importance of social contacts between producers and consumers, motivation differences among farmers to participate, and the role of different modes of distribution have all been identified as influencing factors for direct marketing (Holloway et al., 2007). This proximity encourages peri-urban farmers to identify market niches, innovate and adapt to new demands, as Le Grand and van Meekeren (2008) could show based on their Dutch case study. Gallent (2006) reinterprets this as a potential locational advantage, as the environmental awareness of consumers regarding agricultural production increases. Other commentators remain doubtful however, arguing that urban proximity offers only a limited development potential for the marketing of local products due to the globalised food market (Lohrberg, 2001; Hildmann and Casper, 2004; Jarosz, 2008). Depending on the specific product type, less than 20% of the yields are marketed regionally, with vegetables more prevalent than cereals (Hildmann and Casper, 2004). Concentration of direct marketing on a particular consumer segment (characterised by highly affluent and educated individuals) is seen as a critical limitation that prevents direct marketing from being a true alternative to anonymous mass-production (Lohrberg, 2001). However, Wilson (2007) argues that locally embedded production and short supply chains reduces dependency on world markets, and contributes to a strong multifunctionality of agriculture, particularly in the peri-urban area.

Multifunctional development of peri-urban agriculture

Agriculture in peri-urban areas is under tremendous pressure. Market liberalisation and earning squeeze for arable and livestock production, socio-economic transitions, and a land-market situation characterised by high land prices and decoupling ownership-producer-relationships are all factors that have influenced the debate as to whether agriculture has a chance of survival at the fringes of urban agglomeration (van der Falk et al., 2009). By focusing on peri-urban areas across Europe, this literature review has attempted to draw attention to the opportunities and perspectives that the multifunctional development paradigm offers in regards to adapting and modernising PUA.

Lifestyle changes, increasing leisure time, a ‘quality of life’ orientation and growing environmental and climate change concerns have all contributed to urban society’s increasing interest in having agriculture at its doorstep. Along with its role in preserving biodiversity, as well as delivering fresh air, drinking water and regional food, farming in peri-urban areas is recognised as an integral part of the cultural landscape, which provides environmental amenities, accessible green open spaces and recreational services. But as a pleasant living environment, it also attracts new and affluent neighbours who purchase small holdings, which in turn drives up housing development and land prices. Despite, a further erosion of the productive capacity, by responding to this multitude of urban demands by adapting farm strategies, PUA has improved its economic viability. Farmers in peri-urban area often find direct ways for directly marketing their own production while diversifying on-farm activities, such as farm accommodation or horse-keeping. More recently, services with a focus on educational and health care represent another growing field of peri-urban farming activity. In contradiction to the high societal demands for an aesthetical and amenity-rich countryside around urban areas, landscape management and agri-environmental measures are no more common than anywhere else in the rural areas. Potential synergy effects between landscape management practices and other diversification measures remain underdeveloped. However, driven by a more lifestyle

and environmental focus and less exclusively an economical one, urban-oriented adaptive and lifestyle farming types, which are both prevalent in PUA, possess a high affinity to diversify activities beyond conventional crop and livestock production.

Multifunctionality embraces numerous development issues intrinsic to the agricultural countryside in and around towns and cities. In the face of ongoing urban growth, particularly dynamic in peri-urban areas, land resources for agricultural activities are limited and shrinking. At the same time, there is an increase in competing land use activities and interests in the remaining open spaces, such as between recreation, nature protection and intensified agriculture (Rode and von Haaren, 2005; Rogge et al., 2008). Making use of synergy effects and conflict mitigation, multifunctional land use approaches enable efficient provision of these functions and values. Nevertheless, it is important to note that the proliferation of cultural landscape or environmental amenities requires agricultural activity, at least to some extent. Through the provision of marketable or otherwise compensated production of goods and services on the same piece of land, multifunctionality strengthens the economic foundation of PUA, preventing land abandonment. It enables farming as an economically reasonable and competitive alternative to urban development. In this sense, the encouragement of multifunctional PUA represents a complementary element within a double strategy to safeguard valuable open spaces as well as to limit and manage urban growth in peri-urban areas.

Policy and planning for a multifunctional peri-urban agriculture

Reconnecting urban–rural relationships

Many peri-urban areas are far too often represented as fragmented administrative and decision-making entities with frontlines of separation, competition and conflict between the urban and rural spheres. Existing functional interrelationships are neglected, and common perceptions of the values and functions of PUA are left underdeveloped. A policy arena covering the area of the central city and the peri-urban surrounding on the basis of functional interrelationships of rural and urban compartments has therefore been requested. The European Spatial Development Perspective (European Commission, 1999) highlighted the necessity to integrate the surrounding countryside in the spatial development strategies of urban areas to improve the efficiency of land use planning. Vejre et al. (2007a) and Overbeek (2009) argue that a dialogue that includes urban and rural stakeholders and land use actors is needed to evaluate and discuss common interests and perceptions, including what PUA should provide urban society. As Vejre et al. (2007a) point out, when implemented within a common policy and planning agenda, this could lead to an improved socially optimal mix of PUA's functions and services for the urban society. An enhanced understanding of the role of urban consumers is necessary – one that takes consumers' preferences for values and functions into consideration. Along with innovative producers, informed and interested consumers foster the exploitation of the multifunctional potentials of the peri-urban countryside more efficiently. To link the provision of functions and services of PUA with society and potential consumers, it is necessary to reinforce urban–rural linkages.

Zoning, agricultural preservation and urban containment

As a main requirement of a multifunctional development of agriculture and countryside, the preservation of farmland along

with open spaces in the peri-urban area is carried out in many European countries through urban containment and growth management policies. Combined with financial incentives, zoning and urban growth boundaries represent the main planning instruments, such as the Green Belt in the UK (Munton, 1983; Gant et al., 2011), the Copenhagen “Fingerplan” (see Vejre et al., 2007b) or the Green Heart within the Randstad metropolitan region and buffer zones in the Netherlands (see Koomen et al., 2008). The main idea of these concepts is to geographically define zones, adjacent to urban areas (where urban development is prohibited or limited) to prevent encroachment of urban sprawl into the peri-urban open spaces. Adopted in the different countries between the 1930s and 1960s, these zoning schemes have become relatively important and successful in limiting urban growth in the designated areas: developments has been postponed (Gant et al., 2011), general urbanisation rates were reduced (Koomen et al., 2008) and structural requirements for open-space development have been retained (Vejre et al., 2007b). Additionally, territorial separation allows for the coexistence of conflicting land uses within the peri-urban area, either production intensive or leisure and environmentally oriented (Daniel and Perraud, 2009). However, the actual impact of these zoning measures on land preservation is a moot point. Not limiting urbanisation potential in general, restrictions within the open space zones only redistribute development pressure to areas adjacent to them. As Robinson (2004) argues, containment policies put additional pressure on the suburban neighbourhoods and brownfield redevelopment inside the Green Belt, and encourage urban leapfrogging outside of it. Furthermore, changing growth boundaries, local calls for restriction easements, and uncoordinated municipal planning and development permissions (which have been observed in various regional settings) have all raised doubts over the zoning measures' preservation ability (Vejre et al., 2007b; Koomen et al., 2008; Gant et al., 2011).

The criticism applies even more for the multifunctional development of farming in the peri-urban area. Open space preservation comes under the purview of natural areas rather than farmland. Although natural areas enjoy high valuation by the public from an environmental and aesthetic perspective, farming is only given a marginal reason to survive in the peri-urban area (Koomen et al., 2008). More societal acknowledgement is required for the functions and values agriculture can provide the urban public, such as local food and comparably cost-efficient provision of landscape features. Kerselaers et al. (2011) have called for a clear vision as to how and where agricultural land under pressure should be preserved. To this end, they have developed a decision-support mechanism that not only includes agricultural production criteria, but also covers the provision of the multiple social and ecological functions of agriculture. There is strong evidence from various peri-urban case studies that public planning is not capable of addressing the small-scale functional transformations beyond physical land cover changes. Typically, zoning legislations are undermined through the spread of non-agricultural land uses on farms, or the switch from full-time farming to the consumption-oriented use of hobby farmers and residents (Vejre et al., 2007b; Bomans et al., 2009). In contrast to planning methods, which prescribe durable land use, the regulation of a peri-urban post-productive and multifunctional agriculture requires a greater flexibility to respond to the dynamic transitions and the mixture of land uses.

Scholars such as Shoard (2002) as well as Gallent (2006) have criticised the adoption of preservation planning like the Green Belt in the urban fringe as a defensive preservation approach, which rather reinforces the urban–rural divide in planning while lacking a positive and visionary development agenda. Gant et al. (2011) have formulated the need for a proactive approach with

a specific peri-urban agenda. However, it can be agreed that it is necessary to actively control and supervise the transformation of the peri-urban agriculture, its diversification process and the targeted provision of environmental services to meet urban demands. Gallent et al. (2006) and Rode et al. (2006) argue for the possibilities of consensus-oriented concepts of commonly shared, multipurpose land, which enable multifunctional development in a closer sense by spatial and temporal integration of multiple activities and intermediate agricultural land use approaches. Heading in the same direction, Leinfelder (2009) proposed an adaptation of the traditional zoning practice in the case of open space planning. Instead of a geographical definition of a future land use, he suggests a “strategic zoning” approach, which describes purposes and contextual conditions. This appears particularly promising, as it provides a planning opportunity to formulate and support the required co-existence of the same entity’s multiple purposes.

Rural development policy

The spatial conditions in peri-urban areas for agricultural land use differ substantially from peripheral rural ones. However, the agricultural policy and support systems in Europe are still rather oriented towards a continuous rural area. van Berkel and Verburg (2011) argue that this uniformity throughout the EU to promote environmental and land management incentives, as well as single farm payments, does not reflect the diversity of the rural countryside in relation to their development trajectories and framework conditions. This particularly does not meet the requirements of a multifunctional and post-productive development perspective of PUA. To comply with the specific local peri-urban framework conditions, agriculture and rural development schemes require pronounced regional targeting. The consultation process for the reconfiguration of the Common Agricultural Policy has highlighted that PUA requires specific attention (European Commission, 2010). To strengthen PUA against farm-structural changes and urban pressure, support schemes need to be tailored to small and active farmers who focus on peri-urban-specific farm diversification and agri-environmental measures. Changes to eligibility criteria are necessary, such as minimum farm sizes and long contract durations for participation in AES, which inhibit any flexible response to changed land use conditions. In addition, low entry levels of AES (easily adoptable due to low requirements) encourage rather extensive measures, such as pasture management, which is better suited to more remote rural areas. Focusing on local conditions encourages efficiency in the demand-oriented provision of public goods and services. Territorial instruments such as the LEADER initiative or the Less Favoured Area scheme provide interesting approaches, as they support local actors, rural innovation and the inherent agricultural development opportunities on a limited geographical scope.

Conclusion

Although peri-urban areas are exposed to urban pressures, socio-economic and land use changes which all challenge the economic basis of the farm’s survival, this literature review has shown that the multifunctional development paradigm provides an approach that strengthens and modernises peri-urban agriculture. There is a reasonable demand among the urban public for multiple functions and values from farming. Environmental and landscape amenities, which directly contribute to the regional quality of life, are particularly highly valued. Beyond that, peri-urban agriculture is increasingly acknowledged for its deliverance of local food as well as recreational, educational and other social

services. After decades of adaptation, peri-urban farmers have innovatively responded to the pressure and opportunities attached to their geographical adjacency to urban agglomerations. Peri-urban farming is now characterised by a heterogeneous pattern of holdings with intensive and specialised production, high participation in diversification, and low-intensive hobby and lifestyle oriented farms. However, preservation and multifunctional development of agriculture in the peri-urban area requires a broad range of policy and planning measures. Urban containment and zoning measures (such as green belts) provide necessary prerequisites for the open-space preservation in general. Nevertheless, planning instruments have to be adapted to the requirements of multifunctional agriculture. The peri-urban area needs to be recognised as an individual policy arena to overcome the urban–rural divide and strengthen urban–rural relationships. Agricultural policies and financial incentives should take into account a peri-rural area’s difference to the rural countryside, and target development guidance at the situation within the border of urban and rural zones.

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References

- Agger, P., 2001. Access to the post-productivist landscape: the case of Denmark. In: Conference Proceedings “Public Access to Natural, Agricultural Forest Areas” , Clemons-Ferrant, France, September 24–26.
- Allaert, G., De Meulder, B., Huylenbroeck, G., Van Hecke, E., Meert, H., 2006. Preconditions for Sustainable Land Use by Agriculture in Urbanising Network Society. Scientific Support Plan for Sustainable Development Policy. Belgian Science Policy, Brussels, Downloaded from: <http://www.belspo.be/belspo/home/publ/rappCPagr.en.stm> (April 2010).
- Antrop, M., 2004. Landscape change and the urbanization process in Europe. *Landscape and Urban Planning* 67, 9–26.
- Arriaza, M., Cañas-Ortega, J.F., Cañas-Madueño, J.A., Ruiz-Aviles, P., 2004. Assessing the visual quality of rural landscapes. *Landscape and Urban Planning* 69, 115–125.
- Aubry, C., Kebir, L., Pasquier, C., Traversac, J.B., Petit, C., 2008. Transitions in peri-urban agriculture: how short supply chains evolutions question research. Examples and emerging researches in the Ile de France. In: Conference Proceedings “Transitions Towards Sustainable Agriculture, Food Chains and Peri-Urban Areas” , Wageningen, The Netherlands, October 26–29.
- Bailey, A., Williams, N., Palmer, M., Geering, R., 2000. The farmer as service provider: the demand for agricultural commodities and equine services. *Agricultural Systems* 66, 191–204.
- Bell, S., Tyrväinen, L., Sievänen, T., Pröbstl, U., Simpson, M., 2007. Outdoor Recreation and Nature Tourism: A EUROPEAN PERSPECTIVE. *Living Reviews in Landscape* 1, Downloaded from: <http://www.livingreviews.org/lrlr-2007-2> (April 2010).
- Bergstrom, J.C., 2005. Postproductivism and changing rural land use values and preferences. In: Goetz, S.J., Shortle, J.S., Bergstrom, J.C. (Eds.), *Land Use Problems and Conflicts*. Routledge, London, pp. 64–76.
- Bills, N., Gross, D., 2005. Sustaining multifunctional agricultural landscapes: comparing stakeholder perspectives in New York (US) and England (UK). *Land Use Policy* 22, 313–321.
- Bomans, K., Steenberghen, T., Dewaelheyns, V., Leinfelder, H., Gulinc, H., 2009. Underrated transformations in the open space – the case of an urbanized and multifunctional area. *Landscape and Urban Planning* 94, 196–205.
- Boulanger, A., Meert, H., Van Hecke, E., 2004. The societal demand for public goods in peri-urban areas: a case from the Brussels urban region. In: Conference Proceedings “90th EAAE Seminar Multifunctional Agriculture, Policies Markets: Understanding the Critical Linkage” , Rennes, France, October 28–29.
- Bourauoi, M., 2005. Agri-urban development from a land use planning perspective: the Saclay Plateau (France) and the Sijoumi Plain (Tunisia). In: Mougeot, L.J.A. (Ed.), *Agropolis: The social, Political and Environmental Dimensions of Urban Agriculture*. Earthscan, London, pp. 203–238.

- Brandt, J., Vejre, H., 2004. Multifunctional landscapes – motives, concepts and perspectives. In: Brandt, J., Vejre, H. (Eds.), *Multifunctional Landscapes, Volume I – Theory, Values and History*. WIT Press, Southampton, pp. 3–31.
- Brink, A., 2003. Welche Rolle spielt der ökologische Landbau für eine Großstadt. In: Rahmann, G., Nieberg, H. (Eds.), *Ressortforschung für den ökologischen Landbau*. Bundesforschungsanstalt für Landwirtschaft, Braunschweig, pp. 80–83.
- Bryant, C.R., Johnston, T.R.R., 1992. *Agriculture in the City's Countryside*. Belhaven Press, London.
- Buciega, A., Pitarch, M.D., Esparcia, J., 2009. The context of rural–urban relationships in Finland, France, Hungary, The Netherlands and Spain. *Journal of Environmental Policy and Planning* 11, 9–27.
- Buijs, A.E., Pedrolí, B., Luginbuhl, Y., 2006. From hiking through farmland to farming in a leisure landscape: changing social perceptions of the European landscape. *Landscape Ecology* 21, 375–389.
- Busck, A.G., Pilgaard Kristensen, S., Praestholm, S., Primdahl, J., 2008. Porous landscapes – the case of Greater Copenhagen. *Urban Forestry & Urban Greening* 7, 145–156.
- Busck, A.G., Pilgaard Kristensen, S., Praestholm, S., Reenberg, A., Primdahl, J., 2006. Land system changes in the context of urbanisation: examples from the peri-urban area of Greater Copenhagen. *Geografisk Tidsskrift* 106, 21–34.
- Catherine Bickmore Associates, 2003. *The State and Potential of Agriculture in the Urban Fringe*. The Countryside Agency, London.
- Che, D., 2007. Agritourism and its potential contribution to the agricultural economy. In: *CAB Reviews: Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources* 2, No. 063.
- Cooper, T., Hart, K., Baldock, D., 2009. *The Provision of Public Goods Through Agriculture in the European Union*. Institute for European Environmental Policy, London.
- Daniel, F.J., Perraud, D., 2009. The multifunctionality of agriculture and contractual policies. A comparative analysis of France and the Netherlands. *Journal of Environmental Management* 90, S132–S138.
- Davoudi, S., Stead, D., 2007. Urban–rural relationships – an introduction and brief history. *Building and Environment* 28, 269–277.
- de Vries, S., Verheij, R.A., Groenewegen, P.P., Spreeuwenberg, P., 2003. Natural environments – healthy environments? An exploratory analysis of the relationship between greenspace and health. *Environment and Planning A* 35, 1717–1731.
- Di Iacovo, F., 2003. New trends in the relationship between farmers and local communities in Tuscany. In: Van Huylenbroeck, G., Durand, G. (Eds.), *Multifunctional Agriculture: A New Paradigm for European Agriculture and Rural Development*. Ashgate, Aldershot, pp. 101–125.
- Di Iacovo, F., O'Connor, D., 2009. Supporting policies for social farming in Europe: progressing multifunctionality in responsive rural areas. In: *Agenzia Regionale per lo Sviluppo e l'Innovazione nel settore Agricolo-forestale*. Florence.
- EEA, 2006. *Urban Sprawl in Europe – The Ignored Challenge*. Report 10/2006. European Environmental Agency, Copenhagen.
- European Commission, 1999. *European Spatial Development Perspective. Towards Balanced and Sustainable Development of the Territory of the European Union*. European Commission, Potsdam.
- European Commission, 2010. *The Common Agricultural Policy after 2013: Public Debate Summary Report*. European Commission, Brussels.
- Flcury, A., 2002. Agriculture as an urban infrastructure: a new social contract? The sustainable city II: urban regeneration and sustainability. In: *Proceedings 2nd International Conference on Urban Regeneration Sustainability*. WIT Press, Southampton.
- Freibauer, A., Rounsevell, M.D.A., Smith, P., Verhagen, J., 2004. Carbon sequestration in the agricultural soils of Europe. *Geoderma* 122, 1–23.
- Gallent, N., 2006. The rural–urban fringe: a new priority for planning policy? *Planning Practice and Research* 21, 383–393.
- Gallent, N., Anderson, J., Bianconi, M., 2006. *Planning on the Edge: The Context for Planning at the Rural–Urban Fringe*. Routledge, London.
- Gant, R.L., Robinson, G.M., Fazal, S., 2011. Land use change in the 'edgelands': policies and pressures in London's rural–urban fringe. *Land Use Policy* 28, 266–279.
- Gilg, A., Battershill, M., 1998. Quality farm food in Europe: a possible alternative to the industrialised food market and to current agri-environmental policies: lessons from France. *Food Policy* 23, 25–40.
- Gulinck, H., 2004. Neo-rurality and multifunctional landscapes. In: Brandt, J., Vejre, H. (Eds.), *Multifunctional Landscapes – Volume I Theory, Values and History*. WIT Press, Southampton, pp. 63–73.
- Haase, D., Nuissl, H., 2007. Does urban sprawl drive changes in the water balance and policy? The case of Leipzig (Germany) 1870–2003. *Landscape and Urban Planning* 80, 1–13.
- Hall, C., McVittie, A., Moran, D., 2004. What does the public want from agriculture and the countryside? A review of evidence and methods. *Journal of Rural Studies* 20, 211–225.
- Hassink, J., Zwartbol, C., Agricola, H.J., Elings, M., Thissen, J.T.N.M., 2007. Current status and potential of care farms in the Netherlands. *NJAS Wageningen Journal of Life Sciences* 55, 21–36.
- Hildmann, C., Casper, M., 2004. Funktionale Schnittstellen zwischen Stadt und Umland? Das Beispiel der Nahrungsmittelversorgung von Magdeburg. *Hallesches Jahrbuch für Geowissenschaften* 26, 25–36.
- Holloway, L., Kneafsey, M., Venn, L., Cox, R., Dowler, E., Tuomainen, H., 2007. Possible food economies: a methodological framework for exploring food production–consumption relationships. *Sociologia Ruralis* 47, 1–19.
- Hutchinson, J.J., Campbell, C.A., Desjardins, R.L., 2007. Some perspectives on carbon sequestration in agriculture. *Agricultural and Forest Meteorology* 142, 288–302.
- Ilbery, B., Holloway, L., Arber, R., 1999. The Geography of Organic Farming in England and Wales in the 1990s. *Tijdschrift voor Economische en Sociale Geografie* 90, 285–295.
- Ilbery, B., 1987. The development of farm diversification in the UK: evidence from Birmingham's urban fringe. *Journal of the Royal Agricultural Society of England* 148, 21–35.
- Jarosz, L., 2008. The city in the country: growing alternative food networks in Metropolitan areas. *Journal of Rural Studies* 24, 231–244.
- Jongeneel, R.A., Polman, N.B.P., Slangen, L.H.G., 2008. Why are Dutch farmers going multifunctional? *Land Use Policy* 25, 81–94.
- Kaplan, A., Taskin, T., Onenc, A., 2006. Assessing the visual quality of rural and urban-fringed landscapes surrounding livestock farms. *Biosystems Engineering* 95, 437–448.
- Kenyon, W., Hill, G., Shannon, P., 2008. Scoping the role of agriculture in sustainable flood management. *Land Use Policy* 25, 351–360.
- Kerselaers, E., Rogge, E., Dessein, J., Lauwers, L., Van Huylenbroeck, G., 2011. Prioritising land to be preserved for agriculture: a context-specific value tree. *Land Use Policy* 28, 219–226.
- Koomen, E., Dekkers, J., van Dijk, T., 2008. Open-space preservation in the Netherlands: planning, practice and prospects. *Land Use Policy* 25, 361–377.
- Lamprey, B.L., Barron, E.J., Pollard, D., 2005. Impacts of agriculture and urbanization on the climate of the Northeastern United States. *Global and Planetary Change* 49, 203–221.
- Le Grand, L., van Meekeren, M., 2008. Urban–rural relations: Dutch experiences of the leader+network and rural innovation in areas under strong urban influences. In: *Rurality Near the City*.
- Leinfelder, H., 2009. Formalisation of "Open Space as Public Space" in zoning: the Belgian experience. In: van der Falk, A., van Dijk, T. (Eds.), *Regional Planning for Open Space*. Routledge, London, pp. 223–247.
- Lohrberg, F., 2001. *Stadtnahe Landwirtschaft in der Stadt- und Freiraumplanung*, Dissertation downloaded from: <http://elib.uni-stuttgart.de/opus/volltexte/2001/908/> (April 2010).
- Luttik, J., van der Ploeg, B., 2004. Functions of agriculture in urban society in the Netherlands. In: Brouwer, F. (Ed.), *Sustaining Agriculture and the Rural Economy: Governance, Policy and Multifunctionality*. Edward Elgar, Cheltenham, pp. 204–222.
- Marsden, T., 1999. Rural futures: the consumption countryside and its regulation. *Sociologia Ruralis* 39, 501–526.
- Matsuoka, R.H., Kaplan, R., 2008. People needs in the urban landscape: analysis of landscape and urban planning contributions. *Landscape and Urban Planning* 84, 7–19.
- Meert, H., Van Huylenbroeck, G., Vernimmen, T., Bourgeois, M., Van Hecke, E., 2005. Farm household survival strategies and diversification on marginal farms. *Journal of Rural Studies* 21, 81–97.
- Munton, R., 1983. *London's Green Belt: Containment in Practice*. George Allen & Unwin, Hemel Hempstead.
- Munton, R., 2009. Rural land ownership in the United Kingdom: changing patterns and future possibilities for land use. *Land Use Policy* 26, S54–S61.
- Overbeek, G., 2009. Opportunities for rural–urban relationships to enhance the rural landscape. *Journal of Environmental Policy and Planning* 11, 61–68.
- Pedrolí, G.B.M., Van Elsen, T., van Mansvelt, J.D., 2007. Values of rural landscapes in Europe: inspiration or by-product? *NJAS Wageningen Journal of Life Sciences* 54, 431–447.
- Pierr, A., Müller, K., 2009. *Rural Landscapes and Agricultural policies in Europe*. Springer, Berlin.
- Pierr, A., Uthes, S., Waarts, Y., Sattler, C., Happe, K., Müller, K., 2006. Making the multifunctionality concepts operational for impact assessment. In: Meyer, B.C. (Ed.), *Sustainable Land Use in Intensively Used Agricultural Regions*. Alterra, Wageningen, pp. 47–54.
- Poppe, K.J., Vrolijk, H.C.J., Bommel, K.H.M., van Veen, H.B., 2005. Observations on farm structure in Europe. In: *Proceedings of "Congress of the IAAE"*, Brisbane, Australia, August 15, p. 2005.
- Praestholm, S., Kristensen, S.P., 2007. Farmers as initiators and farms as attractors for non-agricultural economic activities in peri-urban areas in Denmark. *Geografisk Tidsskrift* 107, 13–27.
- Praestholm, S., Reenberg, A., Kristensen, S.P., 2006. Afforestation of European landscapes: how do different farmer types respond to EU agri-environmental schemes? *Geojournal* 67, 71–84.
- Primdahl, J., 1999. Agricultural landscapes as places of production and for living in: owner's versus producer's decision making and the implications for planning. *Landscape and Urban Planning* 46, 143–150.
- Quetier, F.F., Gordon, I.J., 2003. 'Horsiculture': how important a land use change in Scotland? *Scottish Geographical Journal* 119, 153–158.
- Qvistrom, M., 2008. A waste of time? On spatial planning and 'wastelands' at the city edge of Malmö (Sweden). *Urban Forestry & Urban Greening* 7, 157–169.
- Ravenscroft, N., Long, H.A.R., 1994. Horses in the countryside: conflict or co-operation. *Journal of the Royal Agricultural Society of England* 155, 79–86.
- Renting, H., Marsden, T.K., Banks, J., 2003. Understanding alternative food networks: exploring the role of short food supply chains in rural development. *Environment and Planning A* 35, 393–411.
- Rettig, S., 1976. An investigation into the problem of urban fringe agriculture in a green belt situation. *Journal of Environmental Planning and Management* 19, 50–74.

- Robinson, G.M., 2004. Geographies of Agriculture: Globalisation, Restructuring and Sustainability. Pearson Education Limited, Harlow.
- Rode, M., von Haaren, C., 2005. Multifunktionale Landnutzung am Stadtrand. Bundesamt für Naturschutz. Bonn-Bad Godesberg, pp. 188.
- Rode, M., Brink, A., von Haaren, Ch., Tessin, W., 2006. Naturschutzorientierte Entwicklung im suburbanen Bereich am Beispiel Hannover-Kronsberg. *Natur und Landschaft* 81 (3), 146–151.
- Rogge, E., Nevens, F., Gulinck, H., 2008. Reducing the visual impact of 'greenhouse parks' in rural landscapes. *Landscape and Urban Planning* 87, 76–83.
- Sharpley, R., Vass, A., 2006. Tourism, farming and diversification: an attitudinal study. *Tourism Management* 27, 1040–1052.
- Shoard, M., 2002. Edgelands. In: Jenkins, J. (Ed.), *Remarking the Landscape: The Changing Face of Britain*. Profile Books, London, pp. 117–146.
- Siebert, R., Dosch, A., Volgmann, A., 2009. Arbeit und Einkommen im ländlichen Raum: Chancen durch Diversifizierung. Ministerium für Infrastruktur und Landwirtschaft des Landes Brandenburg, Potsdam, pp. 41.
- Swagemakers, P., Wiskerke, J.S.C., 2004. Integrating nature conservation and landscape management in farming systems in the Friesian Woodlands (The Netherlands). In: Tress, G., Tress, B., Fry, G., Opdam, P. (Eds.), *Proceedings of the Frontis Workshop From Landscape Research to Landscape Planning: Aspects of Integration, Education and Application*, 6–6–2004.
- Thomas, F., 1996. Stadt, Land, Landwirtschaft. Verbindungen und Verhältnisse. In: TAURUS-Institut (Ed.), *Regionen im Aufbruch. Beiträge und Beispiele zur eigenständigen und nachhaltigen Regionalentwicklung*. TAURUS-Institut, Trier, pp. 135–146.
- Thomas, I., Frankhauser, P., Biemacki, C., 2008. The morphology of built-up landscapes in Wallonia (Belgium): a classification using fractal indices. *Landscape and Urban Planning* 84, 99–115.
- Tobias, S., Nüesch, A., Nebel, R., Guilmain, A., 2005. Suburbane Landwirtschaft oder Landschaftsmanagement? *Agrarforschung* 12, 306–311.
- Torquati, B., Giacché, G., Taglioni, C., Musotti, F., 2008. The Effects of CAP Reform on the Peri-urban Agricultural Area in the Plain of the City of Assisi (Central Italy). In: *Proceedings of EAAE Seminar "The CAP after the Fischler Reform: National Implementations, Impact Assessment and the Agenda for Future Reforms"*, Viterbo, Italy, November 20–21.
- van Berkel, D.B., Verburg, P.H., 2011. Sensitising rural policy: assessing spatial variation in rural development options for Europe. *Land Use Policy* 28, 447–459.
- van der Falk, A., van Dijk, T., Altes, W.K., van den Brink, A., 2009. Planning open spaces: balancing markets, state and communities. In: van der Falk, A., van Dijk, T. (Eds.), *Regional Planning for Open Space*. Routledge, London, pp. 301–323.
- van der Ploeg, J., Long, A., Banks, J., 2002. Rural development: the state of the art. In: van der Ploeg, J., Long, A., Banks, J. (Eds.), *Living Countrysides. Rural Development Processes in Europe: The State of the Art*. Elsevier, Doetinchen, pp. 8–17.
- van Elsen, T., 2010. Zwischen Marktnische und Paradigmenwechsel der Landwirtschaft. In: *AgrarBündnis e.V. (Ed.), Kritischer Agrarbericht 2010*. AgrarBündnis e.V., Konstanz, pp. 104–108.
- van Huylenbroeck, G., van Hecke, E., Meert, H., Vandermeulen, V., Verspecht, A., Vermimmen, T., Boulanger, A., Luyten, S., 2005. Scientific support plan for a sustainable development policy (SPSD II). In: *Development Strategies for a Multifunctional Agriculture in Peri-Urban Areas*. Belgian Science Policy, Brussels.
- van Huylenbroeck, G., Vandermeulen, V., Mettepenningen, E., Verspecht, A., 2007. Multifunctionality of Agriculture: A Review of Definitions, Evidence and Instruments. *Living Reviews in Landscape Research* 1, Downloaded from: <http://www.livingreviews.org/lrlr-2007-3> (April 2010).
- Vandermeulen, V., Verspecht, A., Huylenbroeck, G., Meert, H., Boulanger, A., van Hecke, E., 2006. The importance of the institutional environment on multifunctional farming systems in the peri-urban area of Brussels. *Land Use Policy* 23, 486–501.
- Vejre, H., Abildtrup, J., Andersen, E., Andersen, P., Brandt, J., Busck, A., Dalgaard, T., Hasler, B., Huusom, H., Kristensen, L., Kristensen, S., Præstholm, S., 2007a. Multifunctional agriculture and multifunctional landscapes and land use as an interface. In: Mander, Ü., Wiggering, H., Helming, K. (Eds.), *Multifunctional Land Use – Meeting Future Demands for Landscape Goods and Services*. Springer, Berlin, pp. 93–104.
- Vejre, H., Primdahl, J., Brandt, J., 2007b. The Copenhagen finger plan: keeping a green space structure by a simple planning metaphor. In: Pedrolí, B., van Doorn, A., de Blust, G., Paracchini, M.L., Wascher, D., Bunce, F. (Eds.), *Europe's Living Landscapes: Essays on Exploring our Identity in the Countryside*. KNNV Publishing, Zeist, pp. 311–328.
- Velarde, M.D., Fry, G., Tveit, M., 2007. Health effects of viewing landscapes: landscape types in environmental psychology. *Urban Forestry & Urban Greening* 6, 199–212.
- Verspecht, A., Vandermeulen, V., Van Huylenbroeck, G., 2005. Multifunctional Agriculture in Urbanized Regions: Characteristics of Farmers in the Fringe of Brussels. Ghent University, Ghent.
- Von Thünen, J.H., 1966 (1826). *The Isolated State*. Pergamon, Oxford.
- Weber, G., Seher, W., 2006. Raumtypenspezifische Chancen für die Landwirtschaft. *DISP* 166, 46–57.
- Wheater, H., Evans, E., 2009. Land use, water management and future flood risk. *Land Use Policy* 26, S251–S264.
- Wiggering, H., Müller, K., Werner, A., Helming, K., 2003. The concept of multifunctionality in sustainable land development. In: Helming, K., Wiggering, H. (Eds.), *Sustainable Development of Multifunctional Landscapes*. Springer, Berlin, pp. 3–18.
- Wilson, G., 2007. *Multifunctional Agriculture: A Transition Theory Perspective*. CABI International, Wallingford.
- Zasada, I., Alves, S., Müller, F.C., Piore, A., Berges, R., Bell, S., 2010. International retirement migration in the Alicante region, Spain: process, spatial pattern and environmental impacts. *Journal of Environmental Planning and Management* 53, 125–141.

Paper II

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Agriculture under urban influence: A spatial analysis of farming systems and land-use in European Rural-Urban-Regions

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Abstract (English)

Peri-urban agriculture in metropolitan regions is exposed to severe urbanisation pressures related to land and labour availability, thus limiting farming activities. Nevertheless, peri-urban agriculture reveals specific characteristics that contribute to the local food supply and the management of a multifunctional countryside near towns. This paper seeks to investigate agricultural land-use and farming-system characteristics in peri-urban areas within Rural-Urban Regions (RUR) across the EU27. The RUR model, which includes an allocation of urban, peri-urban and rural areas, is developed and applied in spatial and statistical analyses to identify relationships between urbanisation and agriculture. The results indicate that metropolitan agriculture compensates shrinking land bases by increasing the intensity of the labour and turnover generated, and is furthermore specialised at developing horticultural produce that is oriented towards urban consumer markets.

Abstract (German)

Stadtnahe Landwirtschaft in Metropolräumen ist im Hinblick auf zunehmend begrenzter Anbauflächen- und Arbeitskraftverfügbarkeit sowie Nachbarschaftskonflikten und rechtlicher Beschränkungen schwierigen Rahmenbedingungen ausgesetzt. Dennoch wird deren Wert für die lokale Nahrungsmittelversorgung und die Bewirtschaftung multifunktionaler Landschaften zunehmend anerkannt. Hier werden Ergebnisse räumlicher und statistischer Analysen regionalisierter Agrardaten vorgestellt, die basierend auf der Abgrenzung von Stadt-Umland-Regionen und deren urbanen, peri-urbanen und ländlichen Teilräumen, Qualitäten stadtnaher Landwirtschaft identifiziert. Dabei zeigt sich, dass die begrenzten Flächenpotenziale durch höhere Erlöse bedingt durch Intensivierung und Spezialisierung auf Gartenbau kompensiert werden, die vor allem auch eine besondere Rolle städtischer Märkte nahelegt.

Keywords (English)

Peri-urban, horticulture, competitiveness, specialisation, urban-rural relationships, metropolitan regions, land consumption

Keywords (deutsch)

Stadtnahe Landwirtschaft, Gartenbau, Wettbewerbsfähigkeit, Spezialisierung, Stadt-Umland-Beziehungen, Metropolregionen, Flächenverbrauch

1 Introduction

1.1 Agriculture in peri-urban areas

Historically, cities and urban agglomerations depend on the food supply from the agriculture produced in their hinterlands, while cities provided important markets for agricultural goods due to their concentration of people. According to Thunensian logic of land-use distribution, the adjacency to the urban market is particularly important for the cultivation of fresh and easily perishable products with high transportation cost, which is expressed by the society's high willingness-to-pay within these areas (Hall, 1966). Due to wide-reaching innovations in rail, road and shipping transportation modes, as well as advances in storage technologies, these traditional urban-rural relationships have been eroded and replaced by inter-regional or even global flows and exchange. With increasing environmental concerns, changing recreational and lifestyle interests, as well as a burgeoning consumer awareness for regional and quality food production (Wandel & Bugge, 1997), agriculture today represents an important land-use actor in the hinterlands of urban agglomerations, since it provides multiple goods and services demanded by the urban society (Zasada, 2011).

However, the framework conditions for agriculture in densely populated and urbanised regions differ substantially from that of the remote rural countryside's. There is a comprehensive understanding that farming in urbanised regions takes place in an environment characterised by specific pressures and opportunities tied to the urban area (Bryant and Johnston, 1992; Piorr et al., 2011). First and foremost, the physical conversion of non-sealed surfaces into built-up areas, such as into settlements and modes of infrastructure, occurs almost exclusively at the expense of farmland, and therefore culminates in the further erosion of the productive capacity of metropolitan agriculture, whereby productive land and fertile soils are lost as the number of farms decrease (EEA, 2006). Peri-urban farms have to compete with urban land-use interests on land markets where rents are increasing, along with shortages of arable land and fragmented ownership rights (Robinson, 2004; Munton, 2009).

In response, it has been argued that farms in the urban fringe and beyond have demonstrated a particular adaptive and innovative capacity to cope with the given framework conditions (Beauchesne & Bryant, 1999; Andersson et al., 2009). Regional and national case studies in metropolitan areas have shown a more frequent participation in pluriactivity and lifestyle farming in these areas including part-time, hobby or retirement farmers, along with agri-environmental schemes and landscape management (Tobias et al., 2005; Busck et al., 2008). Particularly in the case of horticulture, comparative location advantages, higher adaptability and urban market orientation have all been observed in various metropolitan areas (Péron & Geoffriau, 2007; Cantliffe & Vansickle, 2008; Zasada et al., 2011). Broad cross-regional comparative analyses of urbanisation's influence on farming is lacking. This is despite the comprehensive empirical evidence already available at a regional level concerning the diversity of the

agricultural sector at the urban-rural fringe, specifically measured in terms of farm sizes, ownership rates, levels of turnover and revenue, occupation type and the specialisation of horticulture as defined by classical land use models. Beyond regional case studies, no large-scale assessments are currently available that would permit comprehensive evidence of peri-urban agriculture's characteristics.

1.2 Main objective, research design and methodology

The main objective of this paper is to investigate the specifics of farming in urbanised geographical settings compared to rural equivalents spread across European regions. It shall be argued that the existence of a specific peri-urban agricultural land-use pattern comes about as a result of specific individual farm structures. This argument is based on previous research findings (Zasada, 2011; Piorr et al., 2011). Small-scale farm structures, widespread land tenures as well as part-time and retirement farming shall be examined in connection with a higher revenue generation, in some cases, a concentration and specialisation on horticulture, and a cultivation of high-value produce. This paper aims to contribute to the empirical evidence of the relationship between farming and urbanisation by applying statistical analysis of European data on agricultural performance and farm structures at a regional level.

The analytical approach combines two main elements – (i) the classification of Rural-Urban Regions (RUR) and the delineation of urban, peri-urban and rural areas, as well as the (ii) statistical analysis of the farming systems used in response to the prevalent urbanisation carried out at the spatial level of administrative NUTS units. The analytical framework presented in figure 1 outlines the procedure and the main methodological steps – (1) urban-rural classification of regions, (2) spatial delineation of urban, peri-urban and rural areas within the regions, (3) identification of the main factors characterising farm systems, as well as uni- and bivariate statistics including (4) rank size comparisons and (5) correlation analysis to determine the characteristics and distinctiveness of metropolitan and peri-urban agriculture. Section three presents both the applied methodology and the results related to the spatial classification of urbanisation characteristics. In section four, the influence of urbanisation on farming systems in Europe is explored. A discussion of the results is carried out in section five, while section six contains the final conclusions.

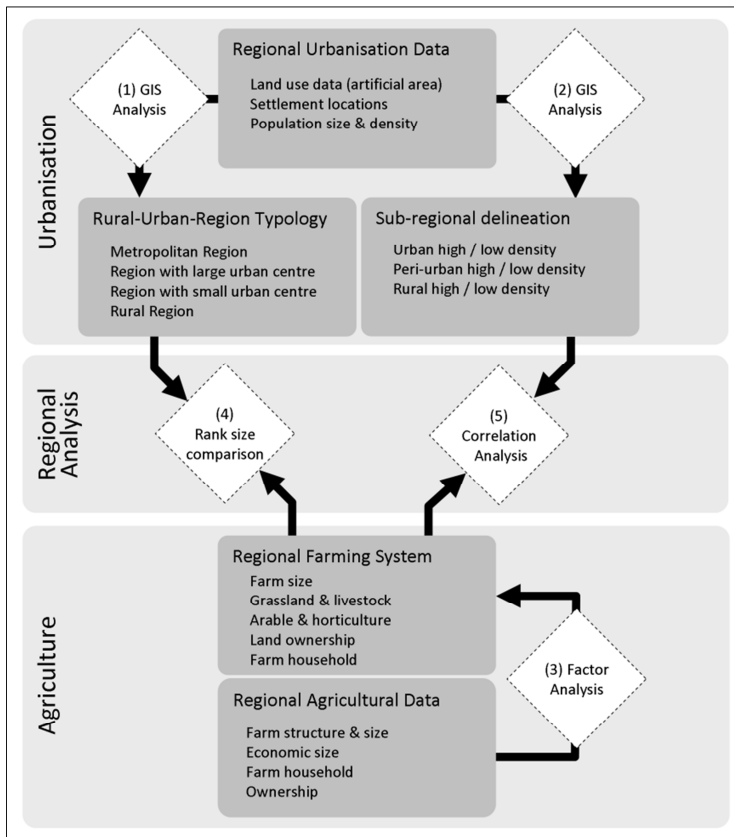


Figure 1. Analytical Framework.

2 Spatial determination of urbanisation

Within this paper, urban influence on agriculture and horticulture is perceived in a twofold manner; firstly by establishing whether the region in question belongs to a functional urban area of a city; and, secondly, by examining the topological perspective of urbanisation in terms of actual land use. As a common market for intra-regional land, labour, housing and trade, functional urban areas (FUA) also shape the hinterland catchment areas of urban agglomerations, which in turn also represent an important consumer market for regional agriculture (Hall & Hay, 1980; OECD, 2002). Urbanisation of rural areas also therefore refers to the intensity of the spatial interaction between urban settlements and the nearby farmland, as well as the conflicts and opportunities it brings about for peri-urban agriculture (Bryant & Johnston, 1992; Robinson, 2004; Gant et al., 2011).

For the implementation of both notions of urbanisation within a spatial modelling process, two different approaches are applied. As a first step, a European typology of RUR regions spatially combines NUTS3 units to common regions, which, in a second step, are further delineated into urban, peri-urban and rural areas as defined by urban land use, proximity to urban centres and population density. The

typology shall encourage the exploration of the farming structure, intensity and farm produce in the peri-urban as an effect of urban and peri-urban region characteristics as well as population distribution pattern, demanding agricultural production in the centres' vicinity in different ways.

2.1 European typology of Rural-Urban Regions

Various European approaches exist to describe urban influence on neighbouring rural areas, as well as to spatially delineate regional functional urban areas (OECD, 2002; ESPON, 2005; EUROSTAT, 2010). These approaches are based on the classification of individual NUTS3 regions or even smaller entities. Within this paper, a more comprehensive analysis of farming systems was carried out using Rural-Urban Regions (RUR) based on a typology which was originally developed between 2007 and 2010 within the European research project PLUREL dealing with peri-urban land use relationships and sustainable urban development (Loibl et al., 2008 Piorr et al., 2011, Pauleit et al., 2013). The RUR classification was also based on NUTS3 aggregates as these represent the smallest spatial unit, where broad-range European-wide statistical data can be obtained. A RUR region was defined by its morphological characteristics and its intraregional relations, reflecting the influence spheres within the region. The regional classification originally did not only consider the extent of functional relationships of urban centres with their surroundings – the commuter catchment areas – but also distinguishes between mono-centric, poly-centric RURs and RURs with no reasonable centre and further divides the RURs into urban, peri-urban and rural sub-regions. For the current investigation, however, particularly the city size ranges and the urban population numbers to be supplied by peri-urban agriculture as well as the RUR's, peri-urban sub-regions are of interest.

The development of the RUR typology and the division into sub-regions were thus depending on data sets with a European-wide scope, namely the CORINE land-cover data set (CLC2000) of the European Environment Agency (EEA) and population numbers of urban centres (GISCO STEU points) and of the NUTS3 regions for the year 2000 by EUROSTAT which correspond with the land cover data from 2000. CLC2000 represents a 100x100m raster data set with 44 land cover classes, which allows quite accurate delineation results for the European wide scale. The European-wide delimitation of RURs finally required a number of working steps. At first, continuous city and settlement area were identified by uniting adjacent or closely neighbouring densely built up areas to “settlement morphological zones” (SMZ), using land cover data CLC2000, class 11 (settlement area). Adjacent or closely neighbouring settlement area patches representing parts of one settlement were merged into a continuous SMZ (Loibl et al., 2008; Zasada et al., 2013).

Second, applying the geographical positions of approximately 4,900 settlement points, derived from the GISCO STEU point database for cities larger than 10,000 inhabitants (in Germany and the Netherlands larger than 20,000) allowed to spatially link population numbers to urban areas building

one SMZ. At the time the RUR classification was carried out (2008), no population figures for local administrative units (LAU) could be made available for entire Europe, so the STEU points in combination with population numbers obtained from the World Gazetteer database served as workaround for allocating inhabitants to core cities. As a third step, SMZs exceeding 50,000 inhabitants (if existing) have been defined as major urban centres of the particular NUTS3 region. These centres served here as the urban nuclei for identifying urban functional catchments as basis for RUR region delimitation.

In a third step, the functional catchment areas of these urban nuclei were estimated. Their extents should be identified by data describing regional interrelations like commuting-, food supply-, or recreation relations. As such European-wide data were not available to identify these relationships, assumptions are made and proxy data applied to estimate the functional outreach. As the urban population can be assumed as trigger for urban-rural relationships, it could be applied as proxy variable to describe the functional area coverage. This extent was also considered a decisive factor for determining the size of the urban market for agricultural goods and services. The influence radius of the city's population extent was thus geometrically expressed by drawing a circle around the core cities, where the radius was determined by a logarithmic expression of the population number. This approach was tested with available commuting data in Austria which allowed identifying the commuting catchments in detail and turned out as appropriate approach describing a proper functional relationship extent.

As final step, those NUTS3 regions which share a common functional area were merged to common RUR regions. The urban nuclei with the largest population size have been considered as centre of the common RUR, the remaining nuclei within such a RUR were identified as sub-centres. The plausibility of this approach has been checked on the basis of further examinations of functional relationships of large cities in a sample of countries. Finally about 1,300 NUTS3 regions within Europe were clustered into 898 RUR regions, with metropolitan, mono-centric and poly-centric and rural characteristics. For the current work the poly-centricity issue is not important as only the urban population numbers to be supplied by peri-urban agriculture are of interest and not the distribution into one or a several urban centres. Thus the RURs are here classified as *Metropolitan regions*, *Regions with large urban centres*, *Regions with medium-sized urban centres*, *Regions with small urban centres* and *Rural regions* (cf. Figure 2).

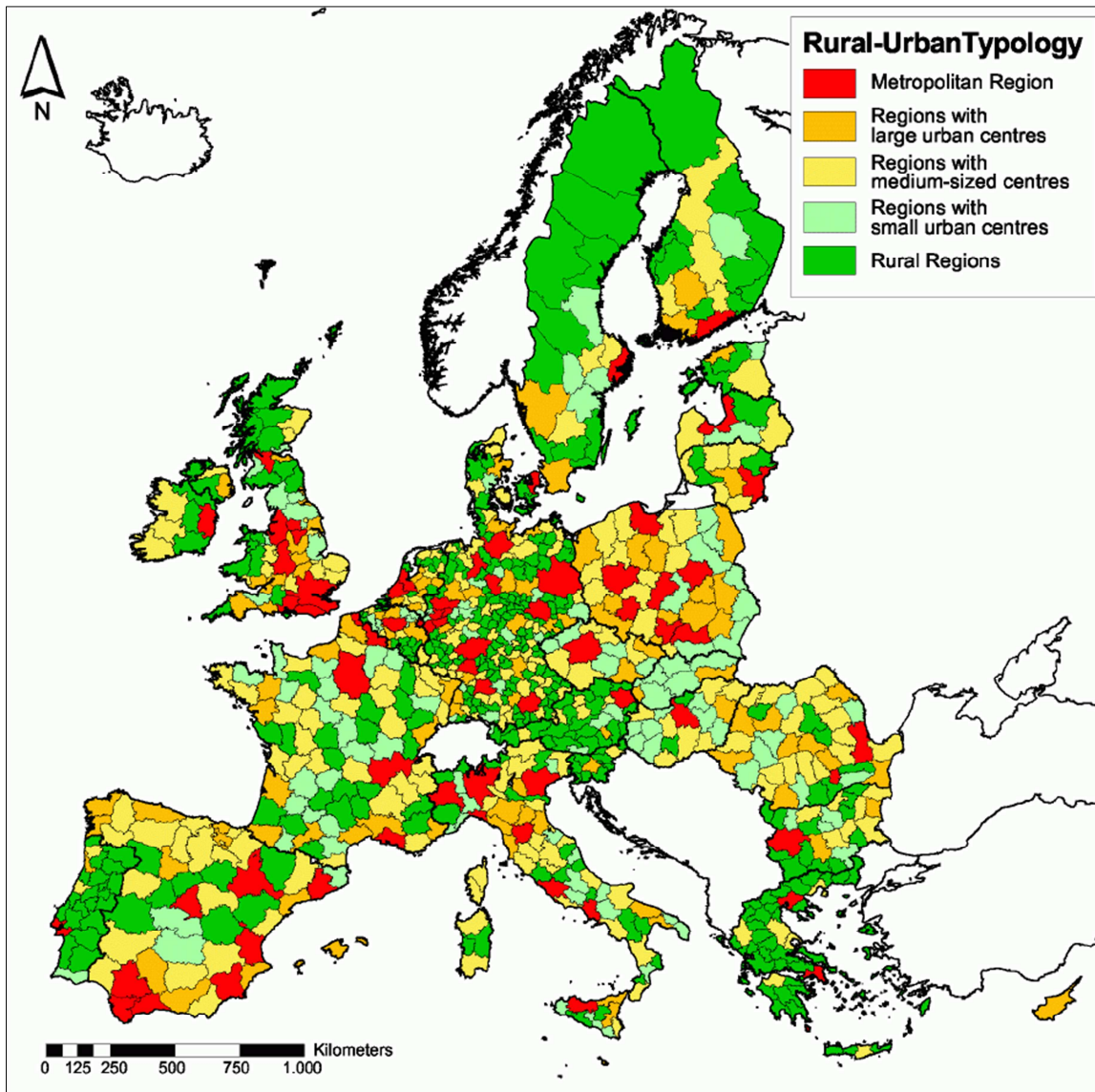


Figure 2. Clustering of NUTS3 entities to Rural Urban Regions.

(i) *Metropolitan RURs* (n=67) encompass one or more metropolitan cities of a minimum 500,000 inhabitants and more than one million inhabitants in the entire RUR. The average total population size is 2.7 million with a population density of 502 inhabitants per km². The share of urban area (artificial surface) amounts to 9.5%. Included in this regional class are several European capital regions such as London, Paris, Madrid or Berlin, but also poly-centric urban agglomerations such as the Dutch Randstad, Manchester-Liverpool or the Silesian and the Rhine-Ruhr region. (ii) *RURs with large urban centres* (n=112) contain one large core city of at least 200,000 inhabitants, without sub-centres or several

medium-size core cities with 200,000 inhabitants or more. The average population size here is 857,000 with a 6.8% artificial surface share. Typical examples are the Swedish Skåne, the Czech South Moravian or the Spanish Alicante region. (iii) *RURs with medium-sized centres* (n=230) contain one or more urban centres of less than 200,000 inhabitants. The average population size of the region reaches 410,000 with a population density across the whole region of 142 inhabitants per km². This type of region encompasses the Polish Opole or Slupski regions, the Belgian Hasselt and the Hungarian Veszprem. *RURs with small urban centres* (n=120) represent regions with smaller urban centres with at least 50,000 inhabitants. On average, 409,000 inhabitants live in this region where urban area covers 4.7% of the total area. East Anglia, Almeria and Cagliari are among those regions. (iv) *Rural Regions* (n=370) lack medium-size urban centres, but contain dispersed small settlements within a rural area. These regions are populated by an average of 157,000 inhabitants with an average density of 84.5 inhabitants per km². It is by far the most frequent region type covering many small rural regions all over EU27 with exceptions of the new member states, like Poland, Czech Republic, Slovakia and Hungary, which lacks this type of region.

2.2 Continuous delimitation of urban, peri-urban and rural areas

Taking the criticism of relatively coarse delineation methodologies at NUTS3 level for analytic purposes (Perlin, 2010) into consideration and gaining understanding of the specific role of urban and peri-urban areas in agriculture and rural development, a continuous delimitation approach was developed. EU27-wide the individual RUR regions are resolved into urban, peri-urban and rural areas of either high or low population density. Therefore the delimitation procedure made use of further geospatial data including a 100x100m raster map for population density (Gallego, 2010), municipality boundaries, LUCAS (Land use/cover area frame survey) data, the European settlement point database and CLC2000. The approach focuses on population concentration in certain land-cover classes by applying a logistic regression model. The delineation was conducted stepwise, in that map algebra functions were applied to establish Boolean decision rules within the GIS-routines to thereby extract the urban, peri-urban and rural areas with either high and low population density. Table 1 gives an overview of the urban, peri-urban and rural sub-regions and their delineation criteria.

Table 1. Urban, peri-urban and rural areas and delineation criteria.

Sub-regions	Delineation criteria
Urban, high density area (U_1)	CLC Class 111 (continuous settlement area) within U_2
Urban, low density area (U_2)	CLC 1 (artificial area) without CLC 13 (mining area) and population >20,000
Peri-urban, high density area (PU_1)	Population density >75 inhabitants per km ² or population >10,000 and within PU_2
Peri-urban, low density area (PU_2)	Population density >40 inhabitants per km ² and max. 300 m from urban area
Rural, high density area (R_1)	Population density >10 inhabitants per km ²
Rural, low density area (R_2)	Population density >0 inhabitants per km ²

Urban high density areas are determined by CLC2000 class 111 (“continuous settlement area”) which generally describes inner-city areas. Population numbers are not considered as criteria here since high-density urban cores are not necessarily populated by inhabitants, as they mainly host commercial and administrative functions. *Urban low density* areas require the presence of CLC land-cover class 1 (“artificial surfaces”), excluding mining areas, to include true urban land cover and population numbers above 20,000 inhabitants in the respective settlement areas.

Peri-urban low density areas require adjacent location (within a maximum distance of 300 meters) to the CLC class 1 (artificial surface, excluding mining area). The distance criteria ensures spatial connection to urban core regions and avoids exclusion of areas distinguished from urban areas as a result of rivers or small open space corridors. Additionally, the population density in peri-urban low density areas must exceed 40 inhabitants per km². *Peri-urban high density* areas are either defined by a minimum population density of 75 inhabitants per km², or by the land-cover class 11 (settlement area) and a settlement population of above 10,000 inhabitants inside the low density regions.

Rural areas are those without larger urban settlements and *low population density*. *Rural high density* areas require at least a population density of 10 inhabitants per km². *Rural low density* areas include all the remaining inhabited areas. The comparable low population density thresholds were used for classification to make them applicable for the entire municipal entities often consisting of uninhabited areas. Table 1 gives an overview of all classes and their criteria. Figure 3 shows a detailed extract of the sub-regional delineation for the area between London, Paris and the Rhine-Ruhr region, an area with particularly extensive peri-urban areas. (see Loibl et al., 2008, Zasada et al., 2013).

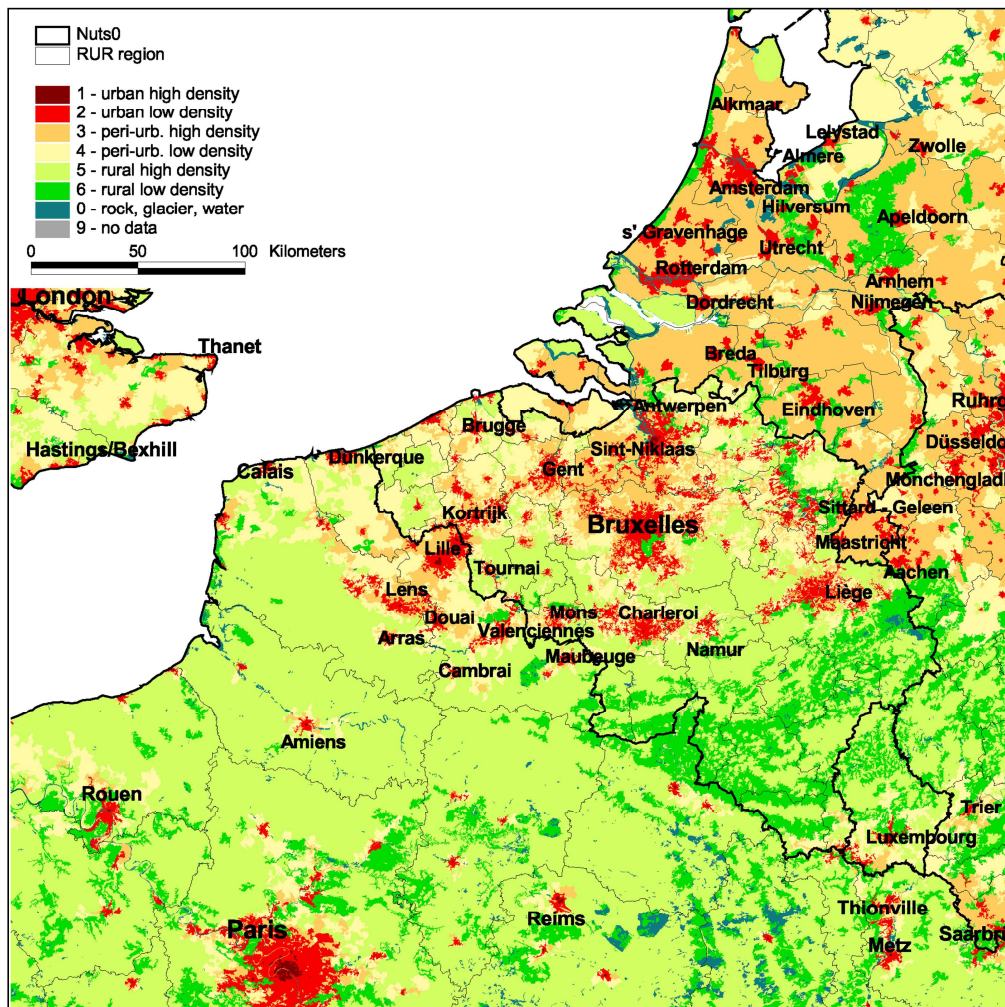


Figure 3. Delineation of the Rural-Urban Regions into urban, peri-urban, rural areas (detail from the EU27 map: Southern parts of the Netherlands, Belgium, Luxembourg, North-eastern France). Source: PLUREL project (Loibl et al, 2008, Zasada et al., 2013)

3 Analysis of agriculture in the context of urbanisation

European agricultural data from the EUROSTAT regional database was used for the analysis of the spatial distribution of agricultural land use and farm structure characteristics and performance indicators, related to those determinants which were identified most relevant in the peri-urban according to a profound literature review (see chapter 1.1 and Zasada 2011). Such are farm types and farming specialisation (e.g. specialised horticulture and the cultivation of high-value produce), as well as economic performance and farm size, land ownership, labour force and age structure. For those determinants different variables, and in case of classified databases distinct classes, were selected and the absolute values of selected variables were aggregated according to the NUTS3 clustering of RUR

regions. To obtain spatial and temporal compliance with the RUR database, a spatial resolution of NUTS3 and the census year 2000 was chosen.

3.1 Factor analysis of European farming systems

In total 23 variables characterising agriculture under urban influence were selected for the statistical analysis. A particular prevalence of small farm sizes in urban proximity was the assumption leading to the selection of distinct area related farm sizes (absolute values in ha and relative share of farm size classes per NUTS3). Analogous, average gross margin in European Standard Unit (ESU) per ha utilised agricultural area (UAA) and share of highly productive farms (min. 100 ESU) were chosen as economic performance variables, assuming comparable advantages in the peri-urban. In order to analyse farm type and farm specialisation, the share of holdings with permanent grassland, with arable production and with different forms of horticultural specialisation were considered. In order to avoid bias due to different area sizes, only the ratio of holdings and not of UAA per NUTS3 was considered. Finally farm ownership, labour force, part-time farming and age structure were selected. Regarding farm ownership particularly the groups of younger and elderly farmers were examined, as proximity to cities could be a trigger to run a farm, full time or part-time. To prevent semantic redundancies through inter-correlations, to reduce the number of variables and to identify the main factors describing the regional farming system, Principal Component Analysis (PCA) was conducted, applying orthogonal Varimax rotation with Kaiser normalisation to maximise the factor differences.

Only 538 of the 898 regions have been included in the statistical analysis as a result of missing variable values for some German, Polish and Danish regions where either some of the variables show no data, or administrative regions have been regrouped which does not allow a comparison along a timeline. Finally seven factors have been extracted out of 23 variables (cf. Tab. 2).

The factor 1 “economic sizes” encompasses variables describing the physical and economic size of the farm holdings. It explains 31.67% of the total variance of all variables. The variables “share of holdings with min. 50 ha UAA” (0.79) and “share of holdings with max. 2 ESU” (-0.79) account for the highest factor loadings, followed by “share of holdings with max. 5 ha UAA” (-0.77), as well as “average size of holdings” (0.71) and “share of holdings with min 100 ESU” (0.54). Furthermore, the factor includes “share of holders with 100% working time in agriculture” (0.54). Consequently, the factor can be termed as “economic size”.

The factor 2 “grassland and livestock production” explains 12% of the total variance by combining positively correlated variables representing grazing livestock production (0.83) and the presence of permanent grassland (0.83). It is further characterised by the absence of permanent crops (-0.67) and farm holders, with less than 25% of working time spent in agriculture (-0.66), indicating full-time farming.

Factor 3 “horticulture” explains 10.7% of the total variance and is determined by the variables for high-value crop produce and specialised horticulture. The highest loading, however, has the variable “average standard gross margin” (0.87). Other variables included in this factor are “share of holdings with flowers and ornamental plants” (0.81) and “share of horticulture-specialist holdings” (0.84).

The following factors explain between 10 and 5% of the total variance and each is loaded by only 2 variables. The high numbers of factors with reasonable shares of explained variance depict the complex structure of the agricultural sector with little or no dependencies between the variables. Factor 4 “land ownership situation” is loaded by the variables “share of area owned” (-0.92) and “share of area rented” (0.91). Factor 5 “arable production” is determined by the variables “share of holdings with arable production” (0.90) and “share of crop-specialist holdings” (0.77). Factor 6 “family labour force” and factor 7 “age structure” refer again more to farm household characteristics. Factor 6 is composed by “share of family labour force” (0.79), “labour force per holding” in average working units (AWU) (-0.75) as well as the share of female farm holders (0.53), while factor 7 is represented by the absence of young farmers (-0.91) and a higher “share of holders who are 65 years and older” (0.67).

Table 2. Principal Component Analysis (PCA) of European regional farming system variables.

<i>Factors</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
<i>N = 538</i>	<i>Economic size</i>	<i>Grassland livestock production</i>	<i>Horticulture</i>	<i>Land Ownership Situation</i>	<i>Arable production</i>	<i>Family labour force</i>	<i>Age structure</i>
<i>Eigenvalue</i>	31.67	12.46	10.73	8.58	7.15	5.37	4.41
Share of holdings with min. 50ha UAA in %	0.79						
Share of holdings max. 2 ESU in %	-0.79						
Share of holdings with max. 5ha UAA in %	-0.77						
Average size of holdings in ha	0.71						
Share of holdings min. 100 ESU in %	0.54						
Share of holders, with working time in agriculture 100% in %	0.54						
Share of holdings with vegetables, melons and strawberries in %	-0.46						
Share of grazing livestock specialist holdings in %		0.83					
Share of holdings with permanent grassland in %		0.83					
Share of permanent crops specialist holdings in %		-0.67					
Share of holders with working time in agriculture max. 25%		-0.66					
Average Standard Gross Margin in ESU per ha UAA			0.87				
Share of horticulture specialist holdings in %			0.84				
Share of holdings with flowers and ornamental plants in %			0.81				
Share of area owned in %				-0.92			
Share of area rented in %				0.91			
Share of holdings with arable production in %					0.90		
Share of field crops specialist holdings					0.77		
Share family labour force in %						0.79	
Labour force per holding in AWU						-0.75	
Share of female holders in %						0.53	
Share of holders who are max. 35 years in %							-0.91
Share of holders who are min. 65 years in %							0.67

3.2 Cross-regional comparison of farming systems

Since census data have been used, the variable value distribution is characterised by large standard deviations, based on many cases with very small figures and strong variance between minimum and maximum values in relationship to the mean value. A considerable number of outliers among regions were found due to a large diversity of farming systems and regional concentrations in Europe, with the Dutch and Spanish vegetable production clusters as only one striking example. However, they were not excluded from the analysis, as they are meaningful for the representation of the spatial manifestation of regional specialisations and specific farm structures, which are assumed to be the result of urban influence.

With the factors of regional farming systems at hand, differences and similarities between the region types were investigated with particular attention given to the characteristics of metropolitan regions. A comparison of mean values of each factor was carried out based on the identified regional classes, aiming at the identification of structural differences between the different region types regarding the agricultural characteristics. Normal value distribution and homogeneity of variances within the classes as requirements for an analysis of variance (ANOVA) could not be confirmed by conducting Kolmogorov-Smirnov and Levene testing. Therefore, testing of the medium rank sizes within the RUR types was applied by using the Kruskal-Wallis test procedure, as a non-parametric alternative to ANOVA (cf. Tab. 3).

Table 3. Medium rank size of factor score by Rural-Urban-Region type.

	Chi ² (Sig.)	Rural-Urban Region Type				
		Metro- politan Regions	Urbanised Region with large centre	Urbanised Region with medium-size centre	Rural Region with small centre	Rural Region without centre
Factor 1 (Economic Size)	2.70 (.609)	245.50	262.05	264.23	262.77	282.03
Factor 2 (Grazing Livestock)	11.24 (.024)	200.89	264.20	267.02	256.37	289.54
Factor 3 (Horticulture)	21.00 (.000)	358.58	304.68	269.17	232.61	257.91
Factor 4 (Ownership Situation)	7.73 (.102)	294.83	279.02	272.33	293.45	249.14
Factor 5 (Arable Production)	3.56 (.469)	254.61	242.89	283.77	266.12	272.06
Factor 6 (Family Labour Force)	10.10 (.039)	252.78	257.71	258.30	240.16	294.86
Factor 7 (Age structure)	3.87 (.424)	283.75	289.80	270.59	282.60	254.96

Among the seven factors, variances of factor scores of “grazing livestock” (factor 2), “horticulture” (factor 3) and “labour force” (factor 6) were found significantly explained by the RUR classification indicated by significance level and chi-square values (see Table 3).

Despite its missing significance, the analysis of the class differences of the rank size reveals, that particularly metropolitan regions are characterised by low factor scores (rank size 245.50) for economic size (factor 1), which indicates a majority of small farms with little turnover in the vicinity of the metropolitan areas. In contrast large farm sizes where land is the most important production resource are domain of the rural area regions. The factor scores for “ownership” show an uneven distribution across the different region types with low rank size values in rural regions (249.19) and high ones in metropolitan regions (294.83), indicating a pronounced land tenure in the latter regions. However, these findings need to be carefully interpreted.

The rank size comparison of the factor 2 “grassland and livestock production” shows an increasing tendency from metropolitan regions (200.89) to rural regions without centre (289.54). Whereas a 22.8% share of grazing livestock specialist holdings was observed in metropolitan regions, that value rises to 33.9% and 28.8% in rural regions with and without small centres. This is different for factor 3 (“horticulture”), where metropolitan regions are significantly characterised by a high medium rank size (358.58) and very low values for the rural regions, whether with (232.61) or without urban centres (257.91). This implies both concentrations of specialised horticultural farms as well as higher average standard gross margins per ha UAA in metropolitan and urbanised regions indicating most efficient and intensive agricultural land use within small plots. Compared to rural regions with small urban settlements – and less demand - (1.6%), the share of horticultural specialists is three time higher in metropolitan areas (6.4%). Also the standard gross margin per hectare in metropolitan (1.4) and urbanised areas (1.5) exceeds the other regions types (each with 1.0) by about 50%. The rank size comparisons for “arable farming” (factor 5) and “age structure” (factor 7) do not show any distinct pattern across the regional classes. In terms of labour force characteristics (factor six) especially rural regions reveals low rank sizes, indicating that family labour orientation is more pronounced there.

3.3 Influence of region type on horticultural production

As suggested in the literature and indicated through the previous variance analysis, horticulture and the cultivation of high-value produce such as vegetables and flowers represents an agricultural activity and specialisation that is most pronounced in metropolitan regions and peri-urban areas. The distribution of variable values representing horticulture is analysed using the RUR typology as well as the peri-urbanisation indicators. Descriptive statistics have been applied to address the role of the region types. The influence of peri-urbanisation is investigated using correlation analysis with regional shares of peri-urban areas.

A large variance of variable values exists across the European regions in general and among regions of the same type due to the skewness of the value distribution. Nevertheless, the results presented in table 4 reveal strong differences of mean values between the region types, particularly between metropolitan regions and the other region types. The average revenue generation per hectare UAA exceeds the other region types by nearly 50%, while horticultural specialisation and the cultivation area of flowers and ornamental plants is exceeded by about 100%. Although only minor variations exist between other region types, ascending values are observed from rural regions to regions with large urban centres. Unlike the other variables, the distribution of holdings with vegetables, melons and strawberries shows only marginal differences between the region types. Only low mean shares in rural regions are noticeable. However, concerning the maximum values, no distinct pattern of regional influence is found. High concentrations of horticultural production cannot be explained by examining the region type.

Table 4. Descriptive statistics for horticultural farming in Rural-Urban Regions.

	Rural-Urban-Region Type					total
	Metropolitan Regions	Urbanised Region with large centre(s)	Urbanised Region with medium-size centre(s)	Rural Region with small centre(s)	Rural Region without centre(s)	
Average Standard Gross Margin in ESU per ha UAA						
Mean	1.39	1.46	1.04	1.06	1.01	1.11
Maximum	10.77	7.66	9.91	7.68	5.62	10.77
Std. Deviation	1.65	1.54	1.10	1.26	0.85	1.17
Share of specialist holdings with horticulture in %						
Mean	6.39	3.76	2.46	2.36	1.61	2.56
Maximum	47.12	44.27	52.93	49.62	40.55	52.93
Std. Deviation	8.52	6.37	4.97	5.73	3.28	5.23
Share of holdings with flowers and ornamental plants in %						
Mean	2.72	2.29	1.12	1.42	1.23	1.47
Maximum	35.42	26.34	11.35	50.49	37.81	50.49
Std. Deviation	5.40	4.63	1.66	5.32	3.82	3.94
Share of holdings with vegetables, melons and strawberries in %						
Mean	16.97	12.64	13.52	12.34	8.93	11.70
Maximum	88.60	88.85	82.09	60.86	86.81	92.09
Std. Deviation	16.54	13.75	17.11	12.86	12.54	14.57

Generally speaking, metropolitan regions are noticeably characterised by the frequent cultivation of high-value produce and by horticulture. Exemplary cases of those metropolitan regions that are characterised by a high share of horticultural holdings are Rotterdam (47.1 %), Lisbon (22.3 %), Barcelona (12.6 %) and Genoa (7.9 %). Regional concentrations are also noticed beyond the influence of the region type. Fruit and vegetable production is most common in the Baltic countries of Lithuania and Latvia, as well as in the Spanish “fruit bowl” located in the south-east of the country. Cultivation of flowers and ornamental plants is concentrated in large parts of the Netherlands, Slovenia and the French-Italian Mediterranean area. Substantial variations in terms of farm structure characteristics, such as the - farm labour characteristics or farm sizes, exist between those EU member states that joined before 2002 and those that joined after the 2002 accession round, as well as between northern and southern Europe. Many eastern and southern European regions, especially in Poland, Bulgaria, Romania and Greece, are characterised by small farm sizes and a high share of family labour. Furthermore, physical conditions and regional farming traditions affect regional farming systems.

3.4 Peri-urban areas, horticulture and high-value crop production

The spatial model of delineated urban, peri-urban and rural areas within RUR regions was applied to investigate the influence of peri-urbanisation on the regional distribution of specialised horticulture and high-value production. The results of the correlation analysis between the peri-urbanisation and horticulture indicators are presented in table 5, suggesting a prevalence of horticulture in regions with higher shares of peri-urban areas. The extent of peri-urban areas with high population densities accounts for a strong influence on the revenue intensity per area of agriculture. The positive correlation can also be found between high-density peri-urban areas and the prevalence of horticultural specialists in areas where flower and ornamental plants are cultivated. In contrast, vegetable and fruit production shows no correlation or even a negative correlation to low density peri-urban areas.

Table 5. Pearson correlation between peri-urbanisation and horticulture & high-value farming

	Peri-urbanisation Indicator	
	Share of peri-urban high density area in %	Share of peri-urban low density area in %
Average Standard Gross Margin in ESU per ha UAA	0.632**	0.324**
Share of horticulture specialist holding in %	0.285**	0.059
Share of holdings with flowers and ornamental plants in %	0.345**	0.139**
Share of holdings with vegetables, melons and strawberries in %	0.079	-0.105*

*Correlation is significant at 0.05 level, **Correlation is significant at 0.01 level (2-tailed)

A comparison of 10% percentiles (deciles) grouping of indicator values sheds a different light on the relationship between peri-urbanisation and horticulture/high-value production. The mean values for average standard gross margin per ha (aSGM) between regions with the lowest (decile 1) and highest share (decile 10) range from 0.74 to 3.1 (Fig. 4a). Seventeen Dutch and Belgian regions belong to the 20 regions of the 10th decile led by Noord Limburg with an aSGM of 9.9. Regions with the lowest shares of peri-urban area, particularly regions in Eastern Germany, Scotland as well as in parts of Portugal and Spain, are all characterised by low aSGM. But differences even occur between regions with varying degrees of peri-urbanisation within countries such as in France and Italy. A similar picture occurs for the variables of horticultural specialisation (Fig. 4b) and the cultivation of flowers (Fig. 4c). The value distribution for the cultivation of vegetables (Fig. 4d) near urban agglomerations is very much influenced by additional factors beyond the location. Due to traditional small scale farming structures, many Lithuanian, Latvian, Bulgarian and Polish regions (also rural) are among the regions with the largest share of vegetable producers. Furthermore, the cultivation of vegetables is very much concentrated in certain specialised climate conditions and favoured regions in the Mediterranean such as south-eastern Spain, Malta or southern Italy. However, these concentrations do not represent a specific domain of agriculture near urban agglomerations.

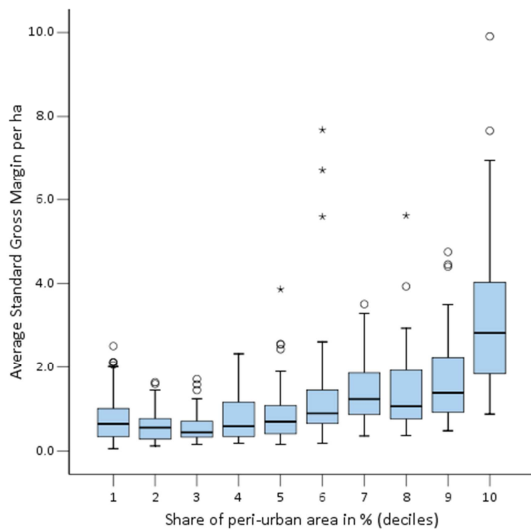


Figure 4a. Average Share of Standard Gross Margin in ESU per ha AA in regions with different shares of peri-urban area.

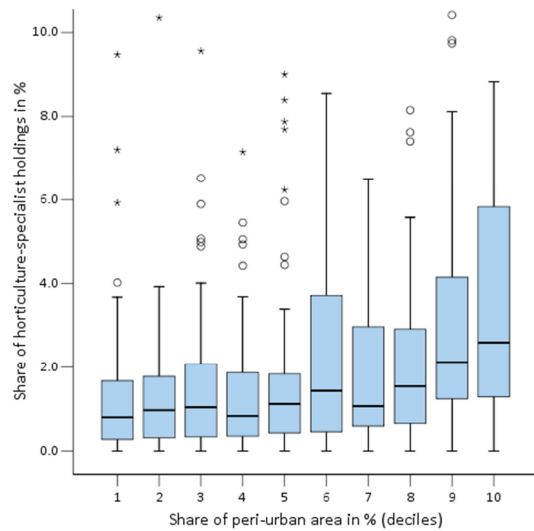


Figure 4b. Share of horticulture specialist holdings (in %) in regions with different shares of peri-urban area.

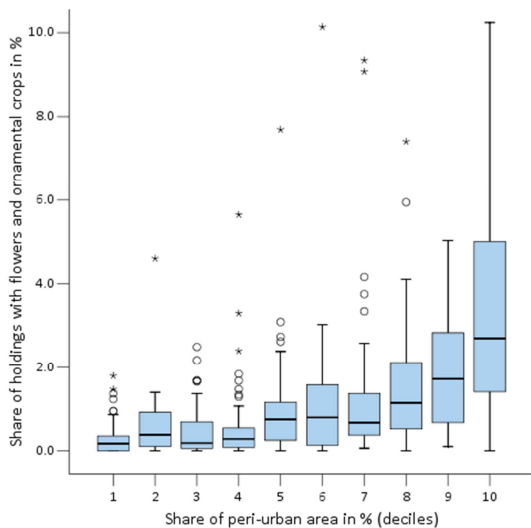


Figure 4c. Share of holdings with flowers and ornamental plants (in %) in regions with different shares of peri-urban area.

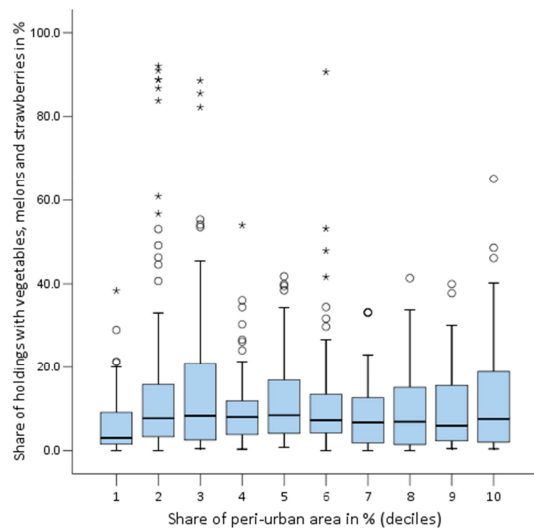


Figure 4d. Share of holdings with vegetables, melons and strawberries (in %) in regions with different shares of peri-urban area.

4 Discussion

With the Rural-Urban-Region model, a typology of European regions has been developed to delineate urban agglomerations to their hinterlands – rural areas under urban influence. In contrast to the OECD (2002), EUROSTAT (2010) and ESPON (2005) approaches, the region typology goes beyond the objective to classify NUTS3 regions, but clusters them spatially into larger common entities (RUR). The application of the typology allows a comprehensive perspective on the behaviour of

functionally inter-related areas. It has been argued that due to urban pressures and opportunities on farming, and due to the responding adjustments, substantial differences exist between modes of agriculture in metropolitan and remote rural areas (Gant et al., 2011; Robinson, 2004). The application of the RUR typology provides an analytical model to study the farming conditions in areas under urban influence. The additional spatial delineation of urban, peri-urban and rural areas gives further information about the (urban) land-use pattern and the population distribution within the RUR regions. Areas are identified that either belong to the urban cores, near-urban or more remote rural areas.

The RUR typology represents a straightforward approach to spatially delineate regional entities with functional urban-rural-relationships, as it makes use of a common model algorithm. As the RUR regions are composed of NUTS3 regions, the typology allows easy application for large-scale regional assessments in the form of European databases, such as EUROSTAT, which can be loss-free and used without additional downscaling procedures. However, the classification possesses two main limitations – sensitivity regarding the size of the NUTS3 regions and the variability of the spatial tailoring over time. In the case of large NUTS3 regions, the RUR algorithm is less capable of delineating influence spheres as RUR regions need to consist of entire NUTS3 regions. Further, in countries with rather small NUTS3 regions, like Germany, the Netherlands and Austria, RUR regions tend to be smaller in size and more rural in nature as the regional population size is correspondingly smaller. The second shortcoming occurs through the reconfiguration of administrative units in many countries, like Poland, the Czech Republic or Denmark. The delimitation and classification procedure provides the opportunity to update the RUR typology. As the for the analysis carried out for this paper the situation of the year 2000 was of interest, also the regional administrative borders of that year was considered.

In the context of this paper, the RUR typology as well as the model of sub-regional delineation has been applied to shape an analysis of urban influence on European agriculture. Despite the focus on urban and metropolitan framework conditions, it is well acknowledged that a multitude of influencing factors inside and outside agriculture exist that contribute to the formation and change of regional farming systems. These encompass the regional climate, natural and landscape conditions, socio-economic situations and development outside agriculture (Renetzeder et al., 2008), or the prevalence of specific farm businesses, farm households and attitudes of farm holders (van der Ploeg, 2003; Jongeneel et al., 2008). As urban-related effects are often less pronounced, further multivariate analyses are not feasible due to a lack of significance. Nevertheless, the European-wide cross-regional analysis enabled some observations of the characteristics of agriculture under urban influence.

In the existing literature empirical examinations of farming systems in the context of urbanisation is limited, individually focussing on certain farm activities or structural differences of farm households and businesses. To enable an exploratory approach to identify aspects, which possess urban-rural relevance a comprehensive approach, including a multitude of variables has been chosen. Within the rank size comparison between the different RUR types, at least three factors account for a significant

explanatory value for the value distribution of the regional farming systems. It can be argued that, despite the influence of other regional parameter, the fact whether a region can be characterised as metropolitan, urbanised or rural has an important effect on the regional agriculture. Looking at the specific factors, which are particularly sensitive for urbanisation – Grassland production and grazing livestock, horticulture, labour force and land ownership to a minor extent, previous assumptions have been substantiated.

Among those, the clear urban-rural slope regarding the concentration of horticultural production might be the most powerful evidence to be drawn from this analysis. The high degree of horticultural specialisation and amount of revenues per ha in metropolitan and urbanised regions support these findings (table 4). Despite a high number of outliers, significant correlation between the share of peri-urban areas and the concentration of horticulture in the region was revealed, supporting previous empirical findings (Oliver, 2000; Péron & Geoffriau, 2007). However, peri-urban areas are first of all observed in countries and regions such as the Netherlands, Belgium or western Germany, which are characterised by a traditionally competitive and specialised farming sector (Cantliffe & Vansickle, 2008). Accompanied by indications for the absence of extensive grassland production and grazing animals as well as low degree of family labour force, it completes a picture of a rather intensified and economically competitive agricultural production in metropolitan and urbanised regions. So does the agricultural labour force in urbanised regions depend much less on the members of the farm household. The average labour force per holding is higher in metropolitan regions, which suggests higher labour intensity and the professionalisation of agriculture.

However, farmers in metropolitan regions tend to rent the land they cultivate more than their colleagues in rural regions. Peri-urban agriculture can be therefore considered as more vulnerable when viewed from the long-term perspective of land availability and competition especially under conditions where urban land use is experiencing continual growth, which is often accompanied by a complex pattern of ownership and property rights as well as land speculation, rising land prices or short-term rental contracts (Munton, 2009). Regarding further assumptions, there is little evidence of pronounced small-scale and part-time farming close to urban agglomerations when the focus is placed solely on pre-2002 member states. No indication of the frequent phenomenon of retirement farming in metropolitan regions was found in the data, since aging share did not significantly differ between the RUR types. Thus research findings from other regional cases (Busck et al., 2008; Tobias et al., 2005) could not be confirmed.

5 Conclusion

Despite the large differences of agricultural systems among European regions, the chosen approach to classify Rural-Urban-Regions and to delineate urban, peri-urban and rural land use has

proven suitable to investigate how urbanisation influences farming. Agriculture in urbanised regions, and more specifically in peri-urban areas, differs from farming in (remote) rural areas. Characterised by specialised horticultural, and to some extent grassland and livestock production, regular arable farming is less frequent in metropolitan areas. In return, farms generate more revenue per ha area, but are also more labour intensive and dependent on rented land.

These specifics of the agricultural systems and framework conditions in urban and peri-urban areas, including the particular pressures, opportunities and respective development potentials, should be taken into consideration for municipal and regional planning and regulation systems as well as the European agricultural and rural development policy. Farming in urban environments is increasingly constrained and marginalised. Its role must not be underestimated, as it is highly specialised, adaptive and competitive. Peri-urban agriculture is in demand to generate regional and local food supply, as well as to provide goods and services beyond food production such as management of cultural landscapes, leisure and recreational opportunities and other ecosystem services. There are valid reasons to control urbanisation and preserve farming. Reflecting the differences of other remote rural conditions, peri-urban farming also requires a specific targeting for agricultural and rural development programming. Attention has to be paid to the specific characteristics and urban framework conditions under consideration. There is a large variance of farming systems and their framework conditions in metropolitan regions across Europe. The comprehensive study only gives indications for general tendencies. More regional in-depth investigations are necessary to learn about the mechanism and dynamics of farming in peri-urban areas, their individual constraints, and the opportunities for a sustainable rural development in peri-urban areas.

6 Acknowledgements

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7 References

Andersson, K., Eklund, E., & Lehtola, M. (2009). Farmers, businessmen or green entrepreneurs? Producers of new rural goods and services in rural areas under urban pressure. *Journal of Environmental Policy and Planning*, 11(1), 29-43. DOI: 10.1080/15239080902774960

- Beauchesne, A. & Bryant, C. (1999). Agriculture and Innovation in the Urban Fringe: The Case of Organic Farming in Quebec, Canada. *Tijdschrift voor Economische en Sociale Geografie*, 90(3), 320-328. DOI:10.1111/1467-9663.00073.
- Bryant, C. R. & Johnston, T. R. R. (1992). *Agriculture in the city's countryside*. London: Belhaven Press.
- Busck, A. G., Pilgaard Kristensen, S., Praestholm, S. & Primdahl, J. (2008). Porous landscapes – The case of Greater Copenhagen. *Urban Forestry & Urban Greening*, 7, 145-156. DOI:10.1016/j.ufug.2007.05.002.
- Cantliffe D. J. & Vansickle, J. J. (2003). *Competitiveness of the Spanish and Dutch Greenhouse Industries With the Florida Fresh Vegetable Industry*. Series of the Horticultural Science Department. University of Florida. Last accessed on November 17, 2011 from: [<http://edis.ifas.ufl.edu/pdffiles/CV/CV28400.pdf>]
- EEA (2011). *Corine Land Cover 1990 and 2006*. The European Topic Centre on Land Use and Spatial Information. Last accessed on November 17 from [<http://www.eea.europa.eu/data-and-maps/data>]
- EEA (2006). *Urban Sprawl in Europe – The ignored challenge*. Copenhagen: European Environment Agency.
- ESPON (2005). *ESPON Project 1.1.1. – Potentials for Polycentric Development in Europe*. Luxembourg: ESPON.
- EUROSTAT (2010). *A revised urban-rural typology*. In: EUROSTAT (ed.): *Regional Yearbook 2010*. Luxembourg: EUROSTAT, 240-253.
- EUROSTAT (2011). *Regional Statistics Database*. Last accessed on November 17, 2011 [<http://epp.eurostat.ec.europa.eu/>]
- Gallego, F. J. (2010). A population density grid of the European Union. *Population and Environment*, 31, 460-473. DOI: 10.1007/s11111-010-0108-y.
- Gant, R. L., Robinson, G. M., & Fazal, S. (2011). Land-use change in the 'edgelands': Policies and pressures in London's rural-urban fringe. *Land Use Policy*, 28, 266-279. DOI:10.1016/j.landusepol.2010.06.007.
- Hall, P. (ed.) (1966). *Von Thunen's Isolated State: An English Edition of Der Isolierte Staat*. (transl. by Carla M. Wartenberg). Oxford: Pergamon.

- Hall, P. & Hay, D. (1980). *Growth Centres in the European Urban System*. London: Heinemann Educational Publishers.
- Jongeneel, R. A., Polman, N. B. P. & Slangen, L. H. G. (2008). Why are Dutch farmers going multifunctional? *Land Use Policy*, 25, 81-94. DOI:10.1016/j.landusepol.2007.03.001.
- Loibl, W., Köstl, M., Steinnocher, K. (2008). Quantitative classification of European major urban regions – Theoretical background and typology. PLUREL Deliverable Report 2.1.3. Last accessed June 5, 2012 [<http://www.plurel.net/images/D213.pdf>]
- Munton, R. (2009). Rural land ownership in the United Kingdom: Changing patterns and future possibilities for land use. *Land Use Policy*, 26S, S54-S61. DOI:10.1016/j.landusepol.2009.08.012.
- OECD (2002). *Redefining Territories: The Functional Regions*. Paris: OECD.
- Oliver, R. (ed.) (2000). *Urban fringe agriculture: report of the APO Seminar on Urban Fringe Agriculture*. Tokyo, Japan, May 17-14, 2000.
- Perlin, R. (2010). Theoretical Approaches of Methods to delimitate rural and urban areas. *European Countryside*, 2(4), 182-200. DOI: 10.2478/v10091-010-0013-5.
- Péron, J. Y. & Geoffriau, E. (2007). Characteristics and Sustainable Development of Peri-Urban Vegetable Production in Europe. In: *International Horticultural Congress - International Symposium on Horticultural Plants in Urban and Peri-Urban Life*, August 13-19, 2006, Seoul, South Korea, 159-170.
- Pauleit, S., Bell, S., Aalbers, C., Nilsson, K. (eds) (2013). *Peri-urban futures: Scenarios and models for land use change in Europe*. Berlin, Heidelberg: Springer.
- Piorr, A., Ravetz, J., & Tosics, I. (eds.) (2011). *Peri-urbanisation in Europe: Towards a European Policy to Sustain Urban-Rural Futures. A Synthesis Report*. Frederiksberg: University of Copenhagen / Academic Books Life Sciences.
- Renetzeder, C., van Eupen, M., Mücher, S., & Wrбка, T. (2008). A Spatial Regional Reference Framework for Sustainability Assessment in Europe. In: K. Helming, M. Pérez-Soba, & P. Tabbush, (eds.). *Sustainability Impact Assessment of Land Use Changes*. Berlin: Springer, 249-268.
- Robinson, G. M. (2004). *Geographies of agriculture: globalisation, restructuring and sustainability*. Harlow: Pearson Education Limited.
- Tobias, S., Nuesch, A., Nebel, R., Guilmain, A., 2005, Suburbane Landwirtschaft oder Landschaftsmanagement? *Agrarforschung*, 12(7), 306-311.

van der Ploeg, J. D. (2003). *The Virtual Farmer: past, present and future of the Dutch peasantry*. Assen, The Netherlands: Royal van Gorcum.

Wandel, M. & Bugge, A. (1997). Environmental concern in consumer evaluation of food quality. *Food Quality and Preference*, 8, 19-26. DOI:10.1016/S0950-3293(96)00004-3.

World Gazetteer Population Database. Last accessed on June 5, 2012 [<http://www.world-gazetteer.com/>]

Zasada, I., 2011, Multifunctional peri-urban areas – A Review of societal demands and agricultural provision of goods and services. *Land Use Policy*, 28(4), 639-648. DOI:10.1016/j.landusepol.2011.01.008

Zasada, I., Fertner, C., Piorr, A., and Nielsen, T. A. S. (2011). Peri-urbanisation and Multifunctional Agriculture around Copenhagen, Denmark. *Geografisk Tidsskrift-Danish Journal of Geography*, 111, 59-72.

Zasada, I.; Loibl, W.; Berges, R., Steinnocher, K; Köstl, M.; Piorr, A.; Werner, A. (2013) Rural-Urban-Regions – A spatial approach to represent urban-rural relationships in Europe in: Pauleit, S., Bell, S., Aalbers, C., Nilsson, K. (eds) *Peri-urban futures: Scenarios and models for land use change in Europe*. Berlin, Heidelberg: Springer.

Paper III

Zasada, I., Fertner, C., Piorr, A. and Nielsen, T.A.S. (2011). Peri-urbanisation and multifunctional adaptation of agriculture around Copenhagen. *Geografisk Tidsskrift–Danish Journal of Geography* **111**(1): 59-72.



Peri-urbanisation and multifunctional adaptation of agriculture around Copenhagen

Ingo Zasada, Christian Fertner, Annette Piorr & Thomas Sick Nielsen

Abstract

Peri-urbanisation, as a process of the physical expansion of settlement areas but also socio-economic transformation, has been recognised as a major spatial development beyond the urban fringes. Agriculture, the main land use actor in the hinterlands of many urban areas is increasingly affected by urban encroachment, responds with adaptation strategies and farming activities to cope with the peri-urban framework conditions. Adaptation pathways encompass specialisation into horticulture as well as enhanced environmental and lifestyle orientation of farming – typical elements of multifunctional agriculture. However, due to the heterogeneity of the peri-urbanisation processes also differences in farming transition are expected. Based on a differentiation into displaced-urbanisation, ex-urbanisation, anti-urbanisation and hidden-urbanisation as main types of peri-urbanisation, variances of farming responses are elaborated for municipal entities in the Copenhagen region in Denmark using statistical census data. Under consideration of location determinants, regression models have been applied to analyse the inter-relationship between different peri-urbanisation processes and multifunctional farming activities. Findings confirm that the differentiation of peri-urban processes is meaningful for the explanation

of spatial distribution of farm adaptation strategies, particularly in the case of leisure and environmental oriented farm practices.

Key words

Rural in-migration, urban-rural-relationship, post-productivism, spatial variation, regression model, farm strategy.

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Introduction

The integration of rural areas surrounding cities into urban regions represents a common spatial development phenomenon in Europe in the recent decades. Physical conversion of open space – in particular agricultural land – for urban purposes and socio-cultural transitions in rural areas through adoption of urban life styles or in-migration of urban dwellers, leads to the establishment of a peri-urban space, and sets different forms of urban and rural living and working into close contact. However, it has been argued that, although under pressure and often marginalised, agriculture has responded to the peri-urban framework conditions by introducing post-productive, consumption-oriented adaptation of farming activities.

In-migration and socio-cultural changes represent relevant drivers for the development of agriculture in peri-urban areas around Copenhagen region (Primdahl, 1999; Busck et al., 2006; Præstholt & Kristensen, 2007). Although a distinct cause-effect relation might not exist, a mutual influence of peri-urbanisation and agriculture has been observed. The central research objective of this paper is to explore the relationship between the heterogeneous types of peri-urbanisation processes (ex-, displaced-, anti- and hidden-urbanisation) and effects on agricultural activity. More specifically, it aims at analysing the spatial co-existence of peri-urbanisation types and the extent of multifunctional farm adaptation, such as small-scale, high-value farming systems, the farmers' participation in landscape management and agri-environmental measures as well as the recreational and lifestyle orientation in peri-

urban areas. From this objective, two main research questions have been derived:

(1) Do ex-, displaced-, anti- and hidden-urbanisation contribute to differentiate processes of peri-urbanisation in the municipalities around Copenhagen? To which extent do location determinants, such as distance to the urban centre, urban form or natural amenities influence the spatial distribution of these processes?

(2) Does the spatial distribution of different peri-urbanisation processes explain the variances in the extent of multifunctional farming, consisting of (a) specialisation in high-value cropping pattern, (b) participation in agri-environmental practices and (c) diversification in recreational services and lifestyle-oriented farming?

Peri-urbanisation

Neglected for a long time, the notion of peri-urban area has been introduced to describe the heterogeneous pattern of settlement pattern at the urban-rural interface, replacing the former model of an urban-rural dichotomy (Errington, 1994). From a European perspective peri-urban areas are often understood as mixed areas under urban influence but with a rural morphology (Caruso, 2001). The Council of Europe once defined the peri-urban sphere as a transition area moving from strictly rural to urban (CEMAT, 2007). On the other hand, it is far from ephemeral, but instead forms new kinds of permanent landscape (Antrop, 2000). Changes in peri-urban space are often results of a high pressure towards urban development (Bertrand, 2007). But this development is not necessarily limited to physical urban development. It is also characterised by the emergence of urban lifestyles in rural areas like hobby farming and second homes (Caruso, 2001; Briquel & Collicard, 2005). Such transformations which take place outside the urban cores can be summarised by the term peri-urbanisation. However, with this very broad definition, peri-urbanisation overlaps and coincides with many other phenomena and dynamics elaborated and described by researchers in the last decades. Besides commercial and infrastructure development, the internal migration pattern represents a major driver for peri-urbanisation. Especially the process of counter-urbanisation is very relevant for the transition of peri-urban areas. Counter-urbanisation describes a migration from the city to the countryside and was first observed in the 1960s and 1970s in the United States and Western Europe. Champion et al. (1989) emphasised that it is not a unidirectional movement but a tendency towards de-concentration, resulting from a

complex pattern of flows. Among others, Mitchell (2004) further elaborated the concept by identification of three different processes of counter-urbanisation dependent on different motivations of the migrants.

Several authors (e.g. Sectorsky, 1955; Halfacree & Boyle, 1998) have defined ex-urbanisation as a process of in-migration of affluent people into rural settings. Staying within close commuting distance, they usually keep their job and daily routines. As a second type, displaced-urbanisation is characterised by out-migration of people based on economic necessities, such as affordable housing, job availability, security and health considerations (Mitchell, 2004). Displaced-urbanisation typically refers to low income groups or young families who cannot afford suitable housing and living environment in the inner city. Rather different from the previous, anti-urbanisation represents the third type of counter-urbanisation. Mitchell (2004) extends the concept from Halliday & Coombes (1995) who used the term to describe urban dwellers moving out into the countryside to escape urban lifestyle. She identified three sub-variants – self-sufficient lifestyle, relocation to enhance quality of life and amenity driven retirement migration.

Ex-urbanisation, displaced-urbanisation and anti-urbanisation represent migratory movements into peri-urban areas. Another urbanisation process refers to socio-cultural changes of the local residents, such as the adoption of urban life styles by the rural population as described by Antrop (2004), Primdahl (1999) and lately in an empirical analysis of another region in Denmark by Madsen et al. (2010). Although acknowledged as important for the transformation of peri-urban areas, only little physical land use changes can be observed. That is why scholars refer to it as hidden-urbanisation. The term was originally introduced by Lewan (1969) and later by van den Vaart (1991) to describe the functional change and conversion of farmsteads by new inhabitants but also the changed behaviour of the local residents. It includes increasing intra-regional relationships in terms of work, trade or leisure, even in peripheral sub-regions, caused by improved accessibility or the change of local conditions.

Multifunctional farm adaptation in peri-urban areas

During the recent decades societal transitions in peri-urban areas towards enhanced environmental consciousness, urban lifestyles and the rise of an aging and leisure-oriented society are challenging the predominant mono-functional

production agriculture (Wilson, 2007). Increased standards of living and available leisure time are reflected by a tendency to buy regional organic food, spend time or even permanently settle down in the near countryside (Primdahl, 1999). Following the European model of multifunctional agriculture for the joint production of commodities and non-commodities (Piorr et al., 2007) or the provision of multiple social, environmental and economic functions (Van Huylenbroeck et al., 2007), organic farming and landscape management, tourism and hobby farming as well as diversification into other gainful activities beyond pure food and fiber production have continually gained importance – particularly in peri-urban areas (Zasada, 2011). Multifunctional farm adaptation in peri-urban areas had been comprehensively studied, focusing on specific farm types (Busck et al., 2006; Præstholm et al., 2006), institutional environment (Vandermeulen et al., 2006) or farm holders characteristics, such as age, education and attitudes (Jongeneel et al., 2008). Other scholars have also taken the question of urban location and density into consideration (Beauchesne & Bryant, 1999; Van Huylenbroeck et al., 2005; Tobias et al., 2005). A tendency was observed that especially peri-urban farmers tend to respond by adapting activities and improve the individual business situation. Also new peri-urban residents have been attracted to start diversification activities, when purchasing farm properties (Præstholm & Kristensen, 2007). Others have interpreted the multifunctional impacts of changes in peri-urban agriculture both from a territorial as well as from an individual farm point of view. Van Berkel & Verburg (2010) for instance described the multifunctional potential of European regions in relationship to the territorial capital as a mix of agricultural, tourism and off-farm employment. For a number of European metropolitan regions, they identified distinctive clustering of multifunctional capacity around large urban centres due to urban demand for multiple rural services.

Due to the proximity and access to consumer groups, peri-urban agriculture is promoted by intensive urban-rural relationships. Results from a recent German survey on structures and trends in organic vegetable production underline the high relevance of direct marketing, as country-wide a large share of organic horticultural holdings sell to the consumer directly (Goy & Maack, 2008). For individual farm holdings, the proximity to urban areas encourages the identification of market niches, innovation and adaptation to new demands, as Cabus & Vanhaverbeke (2003) point out. Accordingly, high productivity and specialisation, focusing on horticultural high-value produces, such as fruits,

vegetables or ornamental plants has been observed in North American (Bryant et al., 1992) and European peri-urban regions (Péron & Geoffriau, 2007). The implementation of landscape management or ecological compensation measures has been also studied in various peri-urban areas, providing evidence for higher participation rates than in other rural areas (Busck et al., 2006; Tobias et al., 2005). More controversy exists on the question of allocation of organic farming in peri-urban areas. Whereas Beauchesne & Bryant (1999) and Ilbery et al. (1999) recognised a concentration of organic producers near urban areas in Canada and the UK, Tobias et al. (2005) found rather under-representation in Swiss urban agglomerations, due to the low suitability of small-scale farm structure.

Within the agricultural transition debate, particularly the rise of the post-productive paradigm is discussed, where the agricultural activity itself is even conceived as recreational activity decoupled from any economical farming motivation (Primdahl, 1999). Agricultural census results from Denmark have shown a significant increase of phenomena such as part-time, hobby and retirement farming (Præstholm & Kristensen, 2007; Busck et al., 2008). Referring to the provision of recreational services, holding and breeding of horses for leisure purposes has been recognised as an increasing income source in peri-urban agriculture (Bailey et al., 2000). Empirical research in the UK, Canada and Sweden indicates significantly higher densities of horses and horse-farms in peri-urban fringes of metropolitan areas compared to other rural areas (Quetier & Gordon, 2003; Elgaker & Wilton, 2008).

Methodology and database

Study area

The case study region for this analysis encompasses an area in the east of Denmark of around 9,000 km², including the islands of Sjaelland – with the Danish capital Copenhagen – Lolland, Falster, Møn and some minor islands. The regional population has experienced a considerable growth since the 1990s, accompanied by migration of certain groups such as families (Aner, 2009) and retirees (Herslund & Fertner, 2010) to the countryside. Most changes in agricultural land use were observed in areas nearby Copenhagen, the urban core of the region (Præstholm & Kristensen, 2007; Busck et al., 2008). A very visible change represents the ongoing development of summer houses and second homes along the coast of the region. Many people have moved and still move in their summer house after retirement in the follow

of the change of §41 in the Danish Planning Law in 1991. The development of new infrastructure expanded the urban area of Copenhagen in recent decades, establishing one big commuter zone (Nielsen & Hovgesen, 2005) like many other monocentric city-regions throughout Europe.

Not only limited to the urban fringes of Copenhagen, but also occurring all over the region in different forms, this process accounts for a substantial impact on agriculture which covers around 70% of the total area. An analysis of CORINE Land use data (EEA) for the year 1990-2006 illustrates some of the major trends in the region. The area of artificial surfaces covering settlement, industry and infrastructure has expanded by 7.2% region-wide. This has basically taken place at the expense of arable land, located close to the urban area and zoned for urban purposes. Forest area marginally decreased whereas pasture and shrubland has enlarged by 14.8% and 17.0%. Related to the increasing valorisation of extensive grassland production, agricultural land utilised for the production of cereals has been reduced from 63% to 57%, whereas the area share of horticulture is rather constant. Due to the intensification of production, the farm structure has been subject to tremendous transitions. Similar to Danish national figures, the average farm size in the case study area has been nearly doubled from below 30 ha to almost 60 ha between the beginning of the 1980s and 2004 – at a time before the decoupling of single farm

payments of the Common Agricultural Policy (CAP) was implemented.

However, according to figures of the Danish statistical office (Danmarks statistik), in 2003 around 20% of all farms in the case area diversified into non-agricultural activities compared to 15% in the whole of Denmark. In the area nearest to Copenhagen the share is even around 25% and has almost doubled since 1998. The typical non-agricultural activities are agricultural services (e.g. use of equipment and machinery). Though, especially direct marketing, riding schools and further processing has considerably increased over the recent years in the case area. Kristensen (2001) has observed intensification and specialisation processes in agriculture in the case study area leading to a decrease arable farming and an increase of horticulture already in the 1980s. Throughout the 1980s and 90s Præstholt & Kristensen (2007) found also farm extensification in this area, related to a shift towards part-time and hobby farming.

Data sets and analytical model

The analysis is conducted at the spatial level of municipal entities, as it represents the most detailed level, where statistical data on both the process of peri-urbanisation as well as farming structure is available. Socio-economic data (Danmarks Statistik Statistikbanken; Danmarks Statistik,

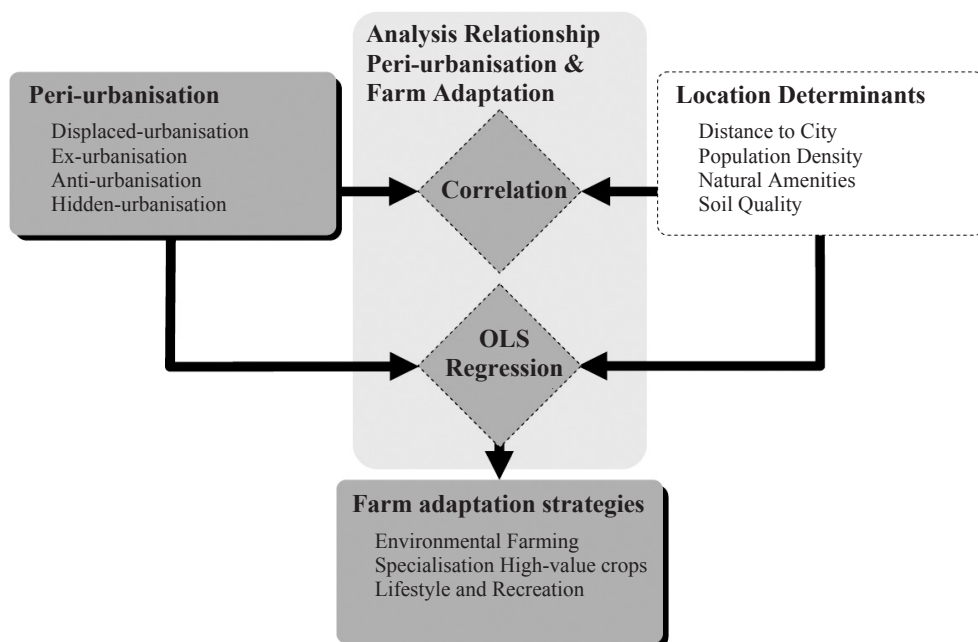


figure 1: Analytical framework.

1989) of all 95 municipalities (situation before municipal reform in 2007) in the case study region, excluding the urban core municipalities of Copenhagen and Frederiksberg were included for the time span of 1986 to 2006.

To address the research questions outlined above, the analytical model for this study integrates the four different types of peri-urbanisation as well as location framework conditions, represented by location determinants as explanatory variables. Through multivariate statistical analysis both are used to explain the value distribution of multifunctional farm adaptation measures in the municipalities of the case study region. The main component is a regression analysis of peri-urbanisation and farm adaptation variables. Location determinants are integrated in the regression analysis to control for their influence. As preliminary step we conducted a correlation analysis of peri-urbanisation variables and location determinants to characterise their patterns (Figure 1).

As a first step, one socio-economic proxy variable was chosen for each type of peri-urbanisation as explanatory variable in the analytical model (Table 1). The variables cannot cover the full spectrum of the respective peri-urbanisation process as described in literature, but they represent relevant elements of the process. As proxy indicator for ex-urbanisation the in-migration of persons with an income above average was chosen. Applying the indicator for a 20-year period, a different threshold for the period 1986-1996 than for 1996-2006 to account for the observed increase in the average income over time was

necessary. Displaced-urbanisation is illustrated by in-migration of children below six years, representing families with small children. Families are constrained by several factors in their housing choice – not just economically but also by the availability of social infrastructure or a safe and green environment. An alternative would be to look at the in-migration of persons with under average income. However, this indicator does less comply with the idea of displaced-urbanisation as it only focuses on the financial situation of persons and no other push factors as safety or environmental concerns. People with the least income often migrate to very remote, typically small town areas and are not dependent on certain urban infrastructure like families but mainly on public transfers. Anti-urbanisation is represented by the in-migration of persons between 60-69 years. As the normal retirement age in Denmark is 65, these are typically retirees. Finally, to illustrate a facet of hidden-urbanisation, we calculated the increase (or decrease) of residents shifting from a local employment to commuting to a different municipality during the analysis period. This should illustrate the change of interrelations in the case study region in respect to working. Making use of correlation analysis, the spatial allocation of the peri-urbanisation processes was studied with the help of location determinants which explain the heterogeneity of the case study area in terms of urbanisation and urban form on the one side as well as bio-physical conditions, such as soil quality and natural amenities on the other side. Insights of the relationship with location determinants are

Table 1: Peri-urbanisation processes and proxy indicators used.

Peri-urbanisation process	Characteristics	Proxy indicator used
Ex-urbanisation	Wealthy urbanites moving into the countryside (Spectorsky, 1955; Mitchell, 2004)	In-migrants with income above average: Yearly income >200,000 DKK (1986-1996) resp. >250,000 DKK (1996-2006) / relative to total population in 1986
Displaced-urbanisation	Migration due to necessity, (employment, living costs, housing availability), Young families (Mitchell, 2004)	In-migrants 0-5 years 1986-2006 / relative to total population in 1986
Anti-urbanisation	Self-sufficient lifestyle, preferring smaller communities, amenity-driven retirement migration (Robinson, 1990; Halliday & Coombs, 1995; Mitchell, 2004)	In-migrants 60-69 years 1986-2006 / relative to total population in 1986
Hidden-urbanisation	Non-agricultural activities, conversion of farmsteads, commuting due to economic reasons (Lewan, 1969; van den Vaart, 1991)	Change of commuters 1986-2006 minus change of employees 1986-2006

Data sources: Danmarks Statistik Statistikbanken; Danmarks Statistik (1989)

Table 2: Multifunctional farming activities.

Adaptation Strategy	Agricultural Activity	Indicator
Specialisation on high-value produces	Greenhouse production	Share of greenhouse area of total UAA 2005 (in %)
	Horticultural production	Share of horticulture area of total UAA 1999 (in %)
Agri-environmental orientation	Organic production scheme	Share of organic farming area from total UAA 2003 (in %)
	Extensive grassland cultivation	Share of grassland from total UAA 2003 (in %)
Lifestyle and recreational farming	Density of horse-keeping	Number of horses 1999 (per ha UAA)
	Part-time and leisure farming	Share of holdings < 10 ha 1999 (in %)

UAA = Utilised Agricultural Area

Data sources: Danmarks Statistik (2000); Institut for Jordbrugsproduktion og Miljø; Kort & Matrikelstyrelsen; Miljøministeriet

important as they affect both the peri-urbanisation and farming activities.

Within the second step of the analytical model, a set of six variables which represent multifunctional farm adaptation was selected – specialisation on high-value produces, environmental orientation and the focus on leisure activities. The variables have been derived from statistical census data (Danmarks Statistik, 2000) and complemented by regional geo-information data on agricultural land use (Institut for Jordbrugsproduktion og Miljø; Miljøministeriet) for the situation towards the end of the observed peri-urbanisation process. Agricultural data on municipality level is collected by different institutions in Denmark and not always in the same frequency. Therefore the datasets used in this analysis originate from the period 1999-2005 to achieve temporal compliance with the peri-urbanisation processes (Table 2).

To analyse the influence of the different types of peri-urbanisation on the spatial distribution of the multifunctional farm adaptation, linear ordinary least square (OLS) regression models have been derived including farming variables as depending and variables of peri-urbanisation and location factors as predictor variables. Strength and direction of the influence of the predictor variable is represented by the estimated standardised coefficient β . The regression model consists of two blocks. In the first block all four peri-urbanisation variables are included into an OLS regression model. The location determinants are in-

tegrated within the second block of the model as control variables. Due to incomprehensive understanding of the location-farm adaptation-relationship (Pfeifer et al., 2009), a stepwise regression was applied here as a straightforward method to reduce the number of variables. The comparison of the regression models which only include the first block (peri-urbanisation) and models which include both blocks (peri-urbanisation and location) enhances the interpretive extent, as collinearities between the peri-urbanisation and location determinants can be revealed.

Results

Spatial pattern of peri-urbanisation

The four peri-urbanisation processes were analysed regarding their spatial pattern considering the distance to the centre of Copenhagen, the population density and natural amenities in the respective municipality (Table 3). The processes show a diverse spatial pattern in the case area.

The processes of ex- and anti-urbanisation features a clear correlation with the distance to Copenhagen. Whereas ex-urbanisation is found close to the city of Copenhagen, the latter one is rather concentrated in more remote rural areas. Apart of that, the other two do not show a significant correlation with distance to Copenhagen, although an interpretation of the allocation maps (Figure 2) reveals a concentration of displaced-urbanisation in many locations

Table 3: Correlation analysis of spatial distribution of peri-urbanisation and location determinants.

	Displaced-urbanisation 1986-2006 (std. value)	Ex-urbanisation 1986-2006 (std. value)	Anti-urbanisation 1986-2006 (std. value)	Hidden-urbanisation 1986-2006 (std. value)
Distance to Copenhagen in km	n.s.	-0.696**	0.541**	n.s.
Population density 2000 in inh./km ²	-0.366**	n.s.	-0.454**	0.282**
Share of coastal area (1 km buffer) in %	-0.363*	n.s.	0.518**	n.s.
Share of forest area in 2000 in %	n.s.	-0.241*	n.s.	n.s.
Share of water and wetland area in 2000 in %	n.s.	n.s.	n.s.	n.s.
Area share of clay-rich soils in %	n.s.	n.s.	n.s.	n.s.
Standardized value of displaced-urbanisation 1986-2006		0.477**	n.s.	-0.665**
Standardized value of ex-urbanisation 1986-2006			n.s.	-0.509**
Standardized value of anti-urbanisation 1986-2006				-0.234*
Standardized value of hidden-urbanisation 1986-2006				

*significance level by $p < 0.1$; **significance level by $p < 0.05$; n.s. = not significant

in medium distance from Copenhagen. Hidden-urbanisation relates to population density as it is concentrated in some municipalities close to Copenhagen as well as in small and medium-sized towns across the region. The bio-physical location determinants account for only partial correlations to peri-urbanisation. The share of coastal area in a municipality correlates positively with anti-urbanisation, mainly representing retirement migration. Displaced-urbanisation shows a slightly negative relation to coastal area as ex-urbanisation and forest area does. Both, water and wetland areas as well as the allocation of fertile clay-rich soils are not significantly correlated with any form of peri-urbanisation. Assessing the spatial interrelationship of the different peri-urbanisation types reveals a distinctive allocation of each of the processes, despite some spatial overlapping. Particularly hidden urbanisation is concentrated in municipalities which are little subject to other types of peri-urbanisation.

Spatial relationships between peri-urbanisation and multifunctional farm adaptation

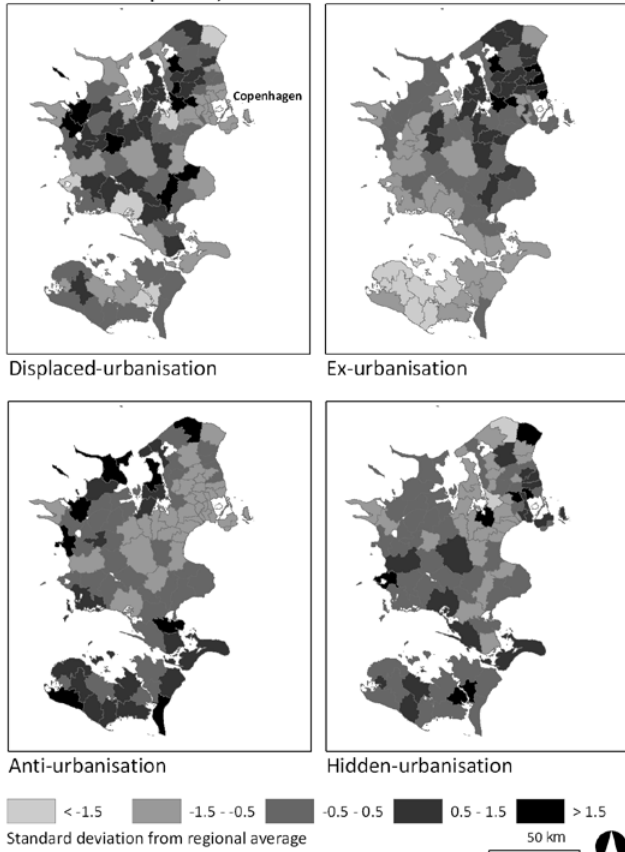
The influence of the four peri-urbanisation processes and the location determinants are represented by regression models for each of the six farming variables. The consideration of the corrected R^2 is meaningful here, as it balances the improvement effect of the model quality with increasing complexity of the model and indicated more clearly the significance of additional predictor variables. As a general finding, the various models are characterised by partly strong

differences regarding the explanatory power as indicated by the corrected R^2 values (Table 4). The model quality varies substantially between the farm adaptation measures. Particularly agri-environmental management practices and diversification into leisure and lifestyle activities are featured by good model performances, whereas the spatial distribution of specialised high-value crop cultivation (horticulture) is only insufficiently explained. The differences of the explanatory power are even more pronounced between regression models which include location determinants or not. There is a significant increase of all model coefficients, as the spatial framework conditions seem to comprise of a strong influence on farm adaptation strategies. Especially for recreation and leisure related farm adaptation – horse-keeping (corr. $R^2 = 71\%$) and small-scale farming (corr. $R^2 = 94\%$) but also extensive grassland management (corr. $R^2 = 98\%$), good model accuracies were accomplished. Partly the coefficients of the predictor variables differ between the two models for as mutual collinearities exist. This is e.g. the case of the distance to Copenhagen and especially ex-urbanisation, a peri-urbanisation process which commonly occurs in the proximity of the metropolitan area. For all regression models, at least one peri-urbanisation process contributes significantly to the value distribution of the dependent variable.

As indicators for environmental-friendly farming practices, organic production and the application of extensive grassland production and has been selected. Figure 3 gives

Peri-urbanisation around Copenhagen

Data for municipalities, 1986-2006

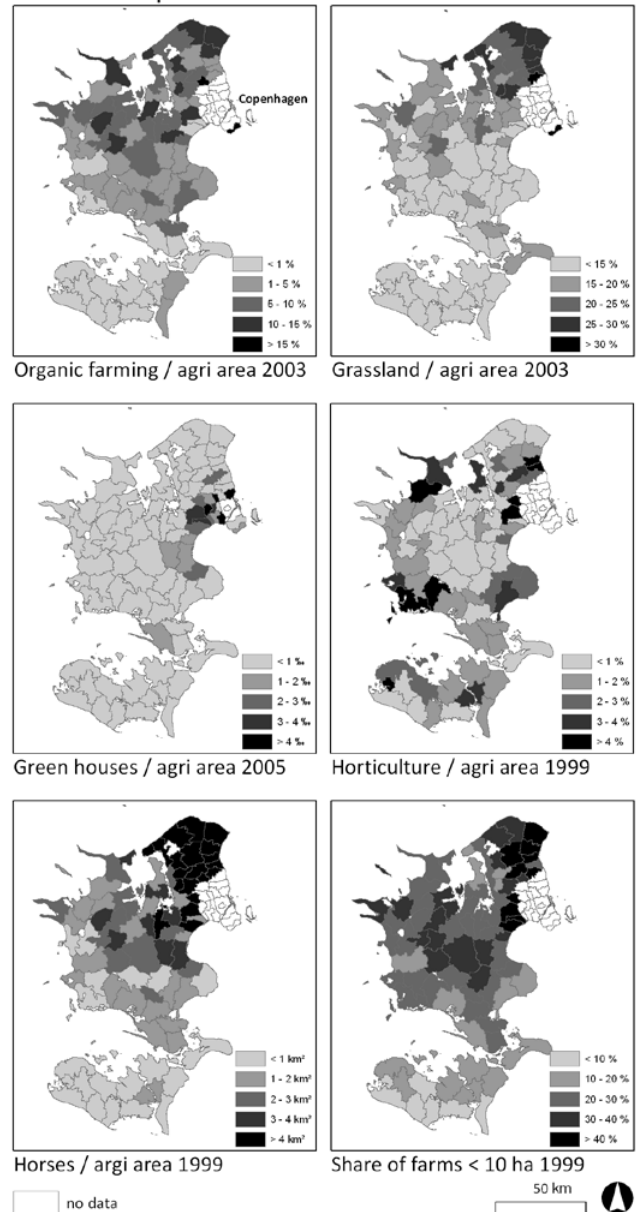


▲ **Figure 2:** Spatial distribution of peri-urban migration processes.

► **Figure 3:** Spatial distribution of farming indicators.

Farming structure around Copenhagen

Data for municipalities



an over view of the value distribution of all farming indicators. The general explanatory power of the regression model for extensive grassland production is much larger (corr. $R^2 = 98\%$) than for organic farming (corr. $R^2 = 58\%$). The latter one is less sensitive for peri-urban developments and location framework conditions. If taken isolated, a considerable positive influence of ex-urbanisation can be found. When including location determinants this relationship is covered by a strong dependency from population

density and displaced (positive) and anti-urbanisation (negative) account for an enhanced influence. In addition, for organic farming and grassland cultivation, comprehensive relationships exist to almost all location determinants with population density accounting for the strongest positive relationship. In contrast, soil quality seems to be a less determining location variable for farm adaptation strategies in the peri-urban – the share of clay-rich soils shows the strongest opposing relationship.

Table 4: OLS Regression models to describe the dependency of farming system differences from peri-urbanisation.

		Organic Farming 2003 (% of total UAA)	Extensive Grassland 2003 (% of total UAA)	Green-house Cultivation 2003 (% of total UAA)	Horticulture 1999 (% of total UAA)	Horse Density 1999 (per ha UAA)	Small-scale Farming 1999 (% holdings <10ha)
<i>Model 1 (Peri-Urbanisation Factors) ¹</i>							
Peri-urbanisation	Displaced-urbanisation 1986-96	n.s.	-0.294**	n.s.	n.s.	-0.273**	n.s.
	Ex-urbanisation 1986-96	0.394**	0.676**	n.s.	0.258**	0.640**	0.440**
	Anti-urbanisation 1986-96	n.s.	0.176*	-0.198**	n.s.	n.s.	-0.371**
	Hidden-urbanisation 1986-96	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
R ²		0.207	0.380	0.085	0.086	0.412	0.434
Corrected R ²		0.165	0.347	0.042	0.037	0.381	0.403
F statistics: p-value (sig.)		4.909 (0.001)	11.494 (0.000)	1.993 (0.103)	1.756 (0.147)	13.136 (0.000)	14.355 (0.000)
<i>Model 2 (Peri-urbanisation and Location Factors) ¹</i>							
Peri-urbanisation	Displaced-urbanisation 1986-96	n.s.	-0.159**	n.s.	n.s.	-0.138**	0.186**
	Ex-urbanisation 1986-96	n.s.	0.208**	n.s.	0.469**	0.538**	-0.185**
	Anti-urbanisation 1986-96	n.s.	0.287**	n.s.	n.s.	n.s.	-0.116**
	Hidden-urbanisation 1986-96	-0.293**	-0.144**	-0.247*	n.s.	-0.353**	-0.476**
Location Factors ²	Distance to Copenhagen	-0.250**	-0.228**	excluded	0.559**	0.451**	-0.394**
	Highway Access	0.626**	-0.223**	excluded	excluded	excluded	excluded
	Population Density 1996	excluded	0.796**	0.629**	0.624**	1.085**	0.893**
	Coastal Shore Length	excluded	0.147**	excluded	0.261**	excluded	0.110**
	Forest Area Share 2000	excluded	-0.127**	excluded	excluded	0.137**	0.086
	Water & Wetland Share 2000	-0.548**	0.237**	excluded	excluded	0.190**	0.307
	Area share of Clay Soils		-0.693**	excluded	excluded	-0.449**	-0.501**
R ²		0.534	0.931	0.330	0.325	0.820	0.979
Corrected R ²		0.488	0.920	0.291	0.259	0.797	0.976
F statistics: p-value (sig.)		11.775 (0.000)	83.925 (0.000)	8.382 (0.000)	4.941 (0.000)	35.493 (0.000)	328.424 (0.000)

UAA = Utilised Agricultural Area

¹ standardised Coefficients Beta;² Location factors in Model 2 have been excluded from the regression model, if likelihood outside 0.05-0.10
*significance level by p<0.1; **significance level by p<0.05; n.s. = not significant

The distribution of horticulture and greenhouse production has been used as representatives for farming specialisation on horticultural produces with high gross margins per cultivated area, such as vegetables or ornamental plants. For both variables the value distribution is characterised by a regional concentration pattern in the south of the region and the direct urban fringe of Copenhagen in the case of horticultural production. Otherwise population density represents a highly influential factor for greenhouse cultivation and horticulture. Beyond that, none of the peri-urbanisation processes show positive coefficients indicating a surprisingly low or non-existent spatial relationship. Both regres-

sion models generally account for only limited explanatory power for the value distribution of the depending variable.

Indicators representing lifestyle and leisure-oriented farming styles are also characterised by rather strong regional disparities. Farm sizes tend to decline from South to North of the case study region. Whereas on the islands of Lolland and Falster, municipalities are characterised by comparably large-scale farming, low values are revealed for the North of Sjaelland. In turn, municipalities in this area feature high stocking rates of horses. The model performances for horse density and small-scale farming indicate comprehensiveness of explanation through peri-urban-

isation pattern and location determinants, although both variables differ substantially regarding the dependency from peri-urbanisation. Prevailing ex-urbanisation is positively related to horse density, but negatively to small-scale farming. There is a clear indication for a spatial divergence between hidden-urbanisation and both recreation-related farming variables. However, the peri-urban influence is clearly overshadowed by location determinants. Again, the population density has an enormous influence on farm-scale and horse density. A positive correlation to water and wetland location is little surprising amongst the natural amenities which determine small-scale farming. Also the absence of small-scale farming in areas rich in soils with above average share of clay was expected, as such are traditional locations for competitive large scale farming,

Discussion

Spatial pattern of peri-urbanisation

Peri-urbanisation is only vaguely defined, usually encompassing urban transformations which take place outside the urban cores (Madsen et al., 2010; Piorr et al., 2011). This paper builds upon the idea to distinguish four peri-urbanisation processes representing different forms of in-migration and lifestyle changes of residents. The spatial pattern of peri-urbanisation is strongly influenced by determinants which characterises the heterogeneity of the case study area. If taken correlation results into consideration, it is recognised that particularly variables which describe economic potential and social integration of the location within the urban agglomeration are more important than natural amenities, such in the case of income-driven ex-urbanisation which takes place close to the city centre, but without any significant relationship to coastal, water or forest area extent. The retirement type of anti-urbanisation intending the purpose of seeking calm and rural environments occurs mainly in municipalities with low population densities and distance to the central city prevail. The particular importance of the coastal location for the retirement migration confirms previous observations in other regions (Zasada et al., 2010). The positive correlation between population density and hidden-urbanisation might be traced back to the prevalence of this peri-urbanisation type around regional centres of the case study region. Areas without significant degree of peri-urbanisation are either located close to Copenhagen or belong to independent small town areas and therefore are already part of an urban agglomeration. They also represent traditional rural areas, often

in a peripheral location, which only sparsely affected of peri-urbanisation yet. The strong spatial dependency of the different peri-urbanisation processes from location determinants make the interpretation of the regression modelling results more difficult, particularly in terms of comparison of the model which exclusively refers to peri-urbanisation as explanatory variables and the one which also integrates location variables.

Multifunctional farm adaptation

In order to find indication about the influence of peri-urbanisation and other location determinants on the spatial distribution of multifunctional farm adaptation a regression analysis of selected farm type and farm management variables was carried out. Despite statistical abstraction and generalisation at the municipal level, the application of a peri-urbanisation model which differentiates four distinct socio-economic development processes has proven meaningful, as significant results were found. Considerable influence differences between the explanatory variables exist regarding significance, strength and even direction of influence.

In-migration processes of younger milieus and families, but also educated and affluent residents, represented by displaced and to a larger extent ex-urbanisation, contribute to a growing consumer potential and purchasing power combined with an appreciation for rural life attributes, attitudes and products. Therefore it is not surprising that particularly the provision of goods and services from farming which are sensitive for local consumer demand – equine services or regional and fresh products from horticulture and organic cultivation – can be found in municipalities, where these kinds of peri-urbanisation take place. This corresponds with previous findings which acknowledged the relevance of direct consumer-producer-relationships, either for organic vegetable production (Goy & Maack, 2008) or for horse-keeping (Bailey et al., 2000). These spatial compliances need to be seen against the background of the densely populated urban fringe location, as particularly population density account for a substantial effect within the regression modelling. However, there is indication that farm adaptation and diversification processes are fostered. Accordingly, in-migration into the peri-urban seems not only to lead to increased population density, but also to an overproportional concentration of consumers that represent target groups for farmers with adaptive strategies. The positive relationship to grassland cultivation remains somewhat surprising and in contrast to research results from Van Huylenbroeck et al. (2005), who address land

suitability issues as drivers for extensive farming schemes in proximity to the city. Research results from Switzerland, however, have confirmed the prevalence of extensive production schemes in urbanised areas, without distinguishing different types of peri-urbanisation (Tobias et al., 2005).

Retirement migration related anti-urbanisation entails no significant or even negative relationship to multifunctional farming activities, except from prevailing extensive grassland management. It can be argued that landscape management measures contributing to the amenity value of the landscape, attract this type of amenity-driven retirement migration. Hidden urbanisation, identified by successive increase of out-commuters of active population, differs substantially from other types of peri-urbanisation regarding the influence on multifunctional farming. Municipalities which are subject to hidden urbanisation are characterised by a general under-representation of multifunctional farming strategies. The absence of further consumer potential affects particularly local market-sensitive activities, such as horse-keeping or organic farming. On the other hand large farm sizes in hidden urbanisation areas are rather unexpected. Kristensen (1999) provides some reasoning, as he revealed, that part-time and hobby farmer tend to rent land to remaining farms, leading to stable farm sizes despite decrease of full-time farming. Beyond other factors that trigger structural change, the increasing farm size might be a result of more land availability due to farmers quitting farm activities part time or completely in order to take up employment in town – and becoming part of the hidden urbanisation community.

Discussing the statistical analysis results on the relationship between peri-urbanisation and farming, the effects of location determinants are already recognised. The framework conditions not only correlate significantly with the spatial distribution of peri-urbanisation, they also influence the farming practices on top of that. It is not surprising that in areas with fertile clay-rich soils, such in the east and south of the Sjaelland region extensive grassland and horse-keeping is less prevalent. But there are even more generally negative correlations between soil fertility and multifunctional farming variables. Going multifunctional is therefore obviously an adaptation strategy for farms in less advantages site conditions. The same applies for the effect of natural amenities on the concentration of leisure oriented farming. Multifunctional farming orientations decrease with distance to the regional centre and decreasing population density. Alongside with soil quality, Pfeifer et al. (2009) suggest also other farm operational factors. Institutional framework conditions, such as local and re-

gional policies have been put forward as important factor to encourage farmers to diversify and participate in environmental programmes (Vandermeulen et al., 2006). Not least, the importance of traditional growing regions for horticulture and greenhouse production, such in some municipalities of the Copenhagen region has been taken into consideration for today's production allocation.

Conclusion

In this paper, the spatial relationship between peri-urbanisation as an in-migration process of urban dwellers into the rural hinterland as well as socio-economic changes of local residents on the one hand and the impact on and response of farming in the region around Copenhagen on the other hand was examined. Regarding the first research question, distinctive spatial differences between the peri-urbanisation processes – displaced-, ex-, anti- and hidden-urbanisation were found. The analysis of the socio-economic transitions in the Copenhagen region revealed that peri-urbanisation is spatially constituted heterogeneously at a local level and very much determined by location determinants. Proximity to Copenhagen as the central city in the region and population density has proven relevant for the spatial distribution, whereas natural amenities play a much less important role. Regarding the second research question, it was found that peri-urbanisation around Copenhagen cannot be seen as a uniform process which influences farm structure and management practises in the rural countryside. Instead, there is indication that the spatial representation of the different peri-urbanisation sub-processes accounts for a substantial influence on farm adaptation strategies towards multifunctionality. Increasing income levels, changing lifestyles and age-structure, related to changing consumer demands for local agricultural goods and services, such as organic food or leisure services obviously contribute to a multifunctional transition of farming in specific locations.

Nevertheless, it is necessary to highlight, that farming in general, but multifunctional adaptation more specifically are strongly depending of the political framework conditions, like the European agricultural and rural development policy. Particularly Rural Development Programmes set incentives for such adaptations. But they do not yet sufficiently consider the specific role and potentials of peri-urban areas and sometimes even exclude them from eligibility (Piorr et al., 2011). However, the different socio-economic processes attached to peri-urbanisation transforms framework conditions for farming and thus farming

itself. Therefore its preservation for the future regional development requires carefully targeted policy and support which takes the specific peri-urban quality of agriculture into consideration.

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References

- Aner, L.G. (2009): Udflytninger fra København. Børnefamiliers udflytninger og bostedsvalg i et hverdagslivsperspektiv. PhD dissertation. Copenhagen, Faculty of Natural Sciences, University of Copenhagen and Centre for Strategic Urban Research. [in Danish]
- Antrop, M. (2000): Changing patterns in the urbanised countryside of Western Europe. *Landscape Ecology* 15(3): 257-270.
- Antrop, M. (2004): Landscape change and the urbanisation process in Europe. *Landscape and Urban Planning* 67(1-4): 9-26.
- Bailey, A., Williams, N., Palmer, M. & Geering, R. (2000): The farmer as service provider: the demand for agricultural commodities and equine services. *Agricultural Systems* 66(3): 191-204.
- Beauchesne, A. & Bryant, C. (1999): Agriculture and Innovation in the Urban Fringe: The Case of Organic Farming in Quebec, Canada. *Tijdschrift voor Economische en Sociale Geografie* 90(3): 320-328.
- Bertrand, N. (2007): Introduction: ESDP Ideals and the Inheritance of Rural Planning Failures. Pp. 1-18 in: Bertrand, N. & Kreibich, V. (eds.): *Europe's city-regions competitiveness: Growth regulation and peri-urban land management*. Assen, Royal Van Gorcum.
- Briquel, V. & Collicard, J.-J. (2005): Diversity in the Rural Hinterlands of European Cities. Pp. 19-40 in: Hoggart, K. (ed.): *The City's Hinterland – Dynamism and Divergence in Europe's Peri-Urban Territories*. Adlershot, Ashgate.
- Bryant, C.R., Deslauriers, P. & Marois, C. (1992): Diversification strategies in agriculture in the rural-urban fringe. Pp. 95-113 in: Mohammad, N. (ed.): *Spatial Dimensions of Agriculture*. New Dehli, Concept Publishing Company.
- Busck, A.G., Pilgaard Kristensen, S., Præstholm, S., Reenberg, A. & Primdahl, J. (2006): Land system changes in the context of urbanisation: Examples from the peri-urban area of Greater Copenhagen. *Geografisk tidsskrift-Danish Journal of Geography* 106(2): 21-34.
- Busck, A.G., Kristensen, S.P., Præstholm, S. & Primdahl, J. (2008): Porous landscapes – The case of Greater Copenhagen. *Urban Forestry and Urban Greening* 7(3): 145-156.
- Cabus, P. & Vanhaverbeke, W. (2003): The economics of rural areas in the proximity of urban networks: evidence from Flanders. *Tijdschrift voor Economische en Sociale Geografie* 94(2): 230-245.
- Caruso, G. (2001): Peri-urbanisation: the situation in Europe. A bibliographical note and survey of studies in the Netherlands, Belgium, Great Britain, Germany, Italy and the Nordic countries. Report prepared for DATAR, France.
- CEMAT (2007): *Spatial development glossary*. Strasbourg, Council of Europe.
- Champion, A.G., Fielding, A.J. & Keeble, D. (1989): Counterurbanisation in Europe. *The Geographical Journal* 155: 52-80.
- Danmarks statistik (1989): *Statistiske efterretninger: Arbejdsmarked*. Copenhagen. [in Danish]
- Danmarks statistik (2000): *Landbrug 1999: statistik om landbrug, gartneri og skovbrug*. Copenhagen. [in Danish]
- Danmarks statistik (2010): *Statistikbanken*. Available from: www.dst.dk
- Elgaker, H. & Wilton, B. (2008): Horse farms as a factor for development and innovation in the urbanrural fringe with examples from Europe and Northern America. *Forest & Landscape Working Papers* 27.
- Errington, A. (1994): The Peri-urban Fringe – Europe's Forgotten Rural-Areas. *Journal of Rural Studies* 10(4): 367-375.
- European Commission (2003): *Agriculture and the environment*. Brussels, European Commission.
- European Environment Agency (2010): *Corine Land Cover 1990 and 2006*. The European Topic Centre on Land Use and Spatial Information. Available from www.eea.europa.org
- Goy, I.A. & Maack, K. (2008): *Bundesweite repräsentative Erhebung und Analyse der verbreiteten Produktions- und Vermarktungssysteme und Aufbau eines bundes-*

- weiten Praxis-Forschungs-Netzwerkes im ökologischen Gartenbau – Situation des ökologischen Gartenbaus in Deutschland. Hannover, Leibniz Universität Hannover. [in German]
- Halfacree, K. & Boyle, P. (1998): Migration, rurality and the post-productivist countryside. Pp. 1-20 in: Halfacree, K. & Boyle, P. (eds.): *Migration into rural areas: theories and issues*. Chichester, Wiley.
- Halliday, J. & Coombes, M. (1995): In search of counterurbanisation: Some evidence from Devon on the relationship between patterns of migration and motivation. *Journal of Rural Studies* 11(4): 433-446.
- Herslund, L. & Fertner, C. (2010): Anti-urbanisation as development chance for rural areas. In-migration and self-employed business in the countryside around Copenhagen. Book of Abstracts, 72, Proceeding of the Conference 'Managing the Urban Rural Interface', University of Copenhagen, Copenhagen, Denmark, 19-22 October 2010.
- Ilbery, B., Holloway, L. & Arber, R. (1999): The Geography of Organic Farming in England and Wales in the 1990s. *Tijdschrift voor Economische en Sociale Geografie* 90(3): 285-295.
- Institut for Jordbrugsproduktion og Miljø: DJF geodata. Det Jordbrugsvidenskabelige Fakultet. Aarhus Universitet. [in Danish]
- Jongeneel, R.A., Polman, N.B.P. & Slangen, L.H.G. (2008): Why are Dutch farmers going multifunctional? *Land Use Policy* 25(1):81-94.
- Kort & Matrikelstyrelsen: Top10DK (Topographical map database of Denmark, 1:10000). Available from: www.kms.dk/English/Maps+and+Topography/Topographic+Data/Denmark+1-10000/
- Kristensen, S.P. (1999): Agricultural land use and landscape changes in Rostrup, Denmark: processes of intensification and extensification. *Landscape and Urban Planning* 46(1-3): 117-123.
- Kristensen, L. (2001): Agricultural change in Denmark between 1982 and 1989: the appearance of post-productivism in farming? *Geografisk tidsskrift* 101(1): 77-86.
- Lewan, N. (1969): Hidden Urbanisation in Sweden. *Tijdschrift Voor Economische en Sociale Geografie* 60(3): 193-197.
- Madsen, M.F., Kristensen, S.B.P., Fertner, C., Busck, A.G. & Jørgensen, G. (2010): Urbanisation of rural areas: A case study from Jutland, Denmark. *Geografisk Tidsskrift-Danish Journal of Geography* 110(1): 47-63.
- Miljøministeriet: Danmarks Miljøportal (The Danish Nature & Environment Portal). Available from: <http://kort.arealinfor.dk>
- Mitchell, C.J.A. (2004): Making sense of counterurbanisation. *Journal of Rural Studies* 20(1): 15-34.
- Nielsen, T.A.S. & Hovgesen, H.H. (2005): Urban fields in the making: New evidence from a Danish context. *Tijdschrift Voor Economische en Sociale Geografie* 96(5): 515-528.
- Péron, J.Y. & Geoffriau, E. (2007): Characteristics and Sustainable Development of Peri-Urban Vegetable Production in Europe. *ISHS Acta Horticulturae*, International Symposium on Horticultural Plants in Urban and Peri-Urban Life: 159-170.
- Pfeifer, C., Jongeneel, R.A., Sonneveld, M.P.W. & Stoorvogel, J.J. (2009): Landscape properties as drivers for farm diversification: A Dutch case study. *Land Use Policy* 26(4): 1106-1115.
- Piorr, A., Müller, K., Happe, K. & Uthes, S. (2007): Agricultural management issues of implementing multifunctionality: commodity and non-commodity production in the approach of the MEA-Scope project. Pp. 167-181 in: Mander, Ü., Wiggering, H. & Helming, K. (eds.): *Multifunctional Land Use: Meeting Future Demands for Landscape Goods and Services*. Berlin, Springer.
- Piorr, A., Ravetz, J. & Tosics, I. (2011): Peri-urbanisation in Europe: Towards a European Policy to Sustain Urban-Rural Futures. A Synthesis Report. Frederiksberg, University of Copenhagen, Academic Books Life Sciences.
- Primdahl, J. (1999): Agricultural landscapes as places of production and for living in: owner's versus producer's decision making and the implications for planning. *Landscape and Urban Planning* 46(1-3): 143-150.
- Præstholm, S. & Kristensen, S.P. (2007): Farmers as initiators and farms as attractors for non-agricultural economic activities in peri-urban areas in Denmark. *Geografisk Tidsskrift-Danish Journal of Geography* 107(2): 13-27.
- Præstholm, S., Reenberg, A. & Kristensen, S.P. (2006): Afforestation of European landscapes: How do different farmer types respond to EU agri-environmental schemes? *GeoJournal* 67(1): 71-84.
- Quetier, F.F. & Gordon, I.J. (2003): 'Horsiculture': How important a land use change in Scotland? *Scottish Geographical Journal* 119: 153-158.
- Robinson, G.M. (1990): Conflict and change in the countryside. Rural society, economy and planning in the developed world. London, Belhaven Press.
- Spectorsky, A.C. (1955): *The exurbanites*. Philadelphia, Lippincott.

- Tobias, S., Nuesch, A., Nebel, R. & Guilmain, A. (2005): Suburbane Landwirtschaft oder Landschaftsmanagement? *Agrarforschung* 12(7): 306-311. [in German]
- Van Berkel, D.B. & Verburg, P.H. (2010): Sensitising rural policy: Assessing spatial variation in rural development options for Europe. *Land Use Policy* 28(3): 447-459.
- Van den Vaart, J.H.P. (1991): Conversion of farmsteads: Hidden urbanisation or a changing rural system? in: van Oort G.M.R.A., van den Berg, L.M., Groenendijk, J.G. & Kempers, H.H.M. (eds.): *Limits to Rural Land Use: Proceedings of an International Conference Organised by the Commission on Changing Rural Systems of the International Geographical Union, Amsterdam, Netherlands, 21-25 August 1990.*
- Van Huylenbroeck, G., Van Hecke, E., Meert, H., Vandermeulen, V., Verspecht, A., Vernimmen, T., Boulanger, A. & Luyten, S. (2005): Development strategies for a multifunctional agriculture in peri-urban areas – Summary. Brussels, Belgian Science Policy.
- Van Huylenbroeck, G., Vandermeulen, V., Mettepenning, E. & Verspecht, A. (2007): Multifunctionality of Agriculture: A Review of Definitions, Evidence and Instruments. *Living Reviews in Landscape Research* 1(3): 1-38.
- Vandermeulen, V., Verspecht, A., Huylenbroeck, G., Meert, H., Boulanger, A. & v. Hecke, E. (2006): The importance of the institutional environment on multifunctional farming systems in the peri-urban area of Brussels. *Land Use Policy* 23(4): 486-501.
- Wilson, G. (2007): *Multifunctional agriculture: a transition theory perspective.* Wallingford, CABI International.
- Zasada, I., Alves, S., Müller, F. C., Piorr, A., Berges, R. & Bell, S. (2010): International retirement migration in the Alicante region, Spain: process, spatial pattern and environmental impacts. *Journal of Environmental Planning and Management* 53(1): 125-141.
- Zasada, I. (2011): Multifunctional peri-urban agriculture – A Review of societal demands and the provision of goods and services by farming. *Land Use Policy* 28(4): 639-648.

Paper IV

Zasada, I., Berges, R., Hilgendorf, J. and Piorr, A. (in press). Horse-keeping and the peri-urban development in the Berlin Metropolitan Region. *Journal of Land Use Science*.

Horsekeeping and the peri-urban development in the Berlin Metropolitan Region

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This article examines the increasing phenomenon of horsekeeping on farms in the Berlin urban fringe. Responding to a growing demand, the equine services became a relevant farming activity in peri-urban agriculture. Although very common in other metropolitan regions, there is only little empirical knowledge on the structure and dimension of the horsekeeping activity. This article assesses farmers' perspectives on the agricultural environment and the contribution to peri-urban development. Potentials and approaches to support diversifying transition of agriculture, environmental protection, maintenance of cultural landscape and nature and the recreational capacity of the peri-urban landscape are explored. The analysis is based on data derived from a questionnaire survey among 59 horsekeeping farms in the case study area. Results confirm that the particular peri-urban conditions with its strengths and weaknesses are acknowledged by diversification activities taken by farms. The strategies taken resulted in four different horsekeeping farm types, varying in aims and intensification.

Keywords: peri-urban area; farm type; diversification; specialisation; multifunctional; landscape

Introduction

Agriculture and rural economy at the fringes of cities and metropolitan areas are undergoing major transformations. Driven by increasing leisure time, consumerism and purchasing power, the countryside surrounding urban areas has been discovered by an affluent urban society as place for living and to spend time for leisure and recreation. At the same time, peri-urban farming has been subject to urban pressures, conflicts and also development opportunities. As the interface between urban settlements and rural hinterlands, peri-urban areas are characterised by complex and fragmented landscape and land use pattern, which undergoes a rapid housing development basically on the expense of farmland (Piirr, Ravetz, and Tosics 2011). Affected by the economics of the urban land market, agricultural areas nearby are comparably scarce and costly (e.g. Cavailhes and Wavresky 2003; Munton 2009). Farm operations are limited by frequent regulatory restrictions, whereas conflicts occur with residential neighbours. Subsequently, farmers have carried out strategies to adapt and diversify activities to comply with these location challenges and the 'new' post- or non-productive demands (Heimlich and Barnard 1997; Ilbery, Healey, and Higginbottom 1997; Zasada 2011).

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Breeding and holding of horses represents a frequent example of these diversification activities in Germany and Europe likewise. Especially, the role of keeping and riding of horses as a leisure activity became more important for agriculture and economic development of rural areas as it requires a broad range of services, such as feeding, stables and equipment as well as training and health care causing substantial income and employment effects (SLU 2001; Liljenstolpe 2009). Liljenstolpe (2009) has estimated the purchasing costs of horses in Western Europe between 4000 and 7000 Euro and monthly stabling cost of between 250 and 700 Euro, generating an employment effect of one full-time job per three to seven horses in Germany.

However, there is only little empirical information on the spatial distribution and concentration, but a number of studies (e.g. Elgåker and Wilton 2008; Zasada, Fertner, Piorr, and Nielsen 2011) suggest that horsekeeping for leisure purposes is a frequent and increasing phenomenon in peri-urban areas, as it strongly depends on the urban demand, as Bailey, Williams, Palmer, and Geering (2000) argue. Although the provision of equine services has been typically carried out as sideline activity (e.g. Schaller 1995), it is also shown that a large diversity of horsekeeping farms exists, for example, regular farms, hobby farmers or professional large-scale holdings, which provide different on-farm equine services such as riding schools, horse accommodation, therapeutic riding, fodder production or horse breeding (Planck 2000). Liljenstolpe (2009, p.5) has highlighted the importance of horsekeeping as economic factor in terms of the large expenses in the equine sector, the total sales and the three to four full-time employees per horse in Germany. Based on the information of German representatives, during the last years the estimated number of horses countrywide remains stable around 1.1 million animals requiring 5.8% of the entire agricultural area for grazing and fodder production. Along with the United Kingdom, Germany accounts for the largest European horse population, despite medium densities per capita and per hectare agricultural areas as compared to European average (Liljenstolpe 2009).

Contribution of horsekeeping to a sustainable peri-urban development

Responding to ecological, economic and societal demands and requirements, the model of sustainable rural development has been put forward as an acknowledged agricultural approach (van der Ploeg and Roep 2003). Apart from diversifying farm activities, horsekeeping promotes different functions of a landscape. It fosters the economic output, while contributing to the landscapes' cultural values and impacting positively on the environment. The economic importance of the equine industry for agriculture is confirmed in several European studies (Bailey *et al.* 2000; Dockered 2000; Planck 2000; SLU 2001; Neuwirth and Penker 2005; Schöner 2005; Liljenstolpe 2009; Elgåker 2011). On the one hand, income is derived from leisure and tourism activities and related small enterprise development (Dockered 2000; Planck 2000). On the other hand, horsekeeping farms gain from funding for implementation of agri-environmental measures (Liljenstolpe 2009). Schöner (2005) has shown that especially horse accommodation is a growing farm income source. Thus, horsekeeping generates employment opportunities and provides perspectives for young farmers as Liljenstolpe (2009) and Dockered (2000) argue. In their UK study, Bailey *et al.* (2000) found that horsekeeping also helps to keep less-productive pastures in utilisation. Horses and horsekeeping are important means for the maintenance of the cultural landscape and farm life, of which they traditionally have been part of (Neuwirth and Penker 2005). The attractive landscape and the equine leisure services at the urban fringe diversify the opportunities for city dwellers for close-by nature sports and recreation. With regard to nature and environmental protection, horsekeeping is

valuable for the conservation of endangered horse species (Dockered 2000). Furthermore, their fodder requirements are highly adapted to the vegetation of extensively managed grasslands, which are of special value for biodiversity and ecological functions. With species-appropriate husbandry, horses can even preserve grasslands through grazing (Seifert, Sperle, Raddatz, and Mast 2005). Otte (1994) has suggested a maximum of 20 animals per group and 1 horse per hectare should not be exceeded.

Synergies and conflicts of horsekeeping

The utilisation of synergies between different activities and functions and the mitigation of conflicts between them represent an intrinsic strength of the rural development approach. Elgåker and Wilton (2008) have confirmed several synergy effects with horsekeeping, particularly concerning rural viability and employment. The EQUUS study (SLU 2001) acknowledges horsekeeping as an important link between urban and rural lifestyles. As it keeps pasture land under management, horsekeeping contributes to the preservation of the cultural landscape and its ecological functions, such as biodiversity or hydrological balance (Rook and Tallwin 2003; Gibon 2005). The provision of equine service enriches the opportunities of outdoor recreation, contributing substantially to the quality of life of residents and visitors. Further, horses are frequently deployed for educational and therapeutical purposes (SLU 2001). Nevertheless, conflicts arise between different stakeholders, especially when equine land use dominates the region. In situations of a massive concentration of horses and horse farms, the development used to be rather negatively connoted as ‘horsiculture’ (Ilbery 1991) or ‘horsification’ (Bomans, Steenberghen, Dewaelheyns, Leinfelder, and Gulinck 2010). They particularly criticise the transformation of the landscape, which is exclusively oriented to horsekeeping. The spatial accumulation of horse farms and high stocking rates cause considerable environmental impacts (Elgåker and Wilton 2008). Overgrazing, horse trampling, habitat fragmentation by fencing and high nutrient input from manure lead to soil degradation, water pollution and loss of biodiversity, which are especially issues in protected areas (Newsome, Cole, and Marion 2004; Newsome, Smith, and Moore 2008). The landscape aesthetics and its cultural value are also affected as Bruns, Ipsen, and Bohnet (2000) show. The overstocking and its negative consequences even lead to prejudice against the employment of horses for nature conservation (Rook and Tallwin 2003). Neighbourhood conflicts with residents due to buildings, noise, manure or allergens are often brought into the discussion by different scholars (Ravenscroft and Long 1994; SLU 2001; Cazaux, Carels, and Van Gijsegem 2007; Elgåker and Wilton 2008; Bomans *et al.* 2010). In peri-urban areas, conflicts arise especially between horse riders and different traffic participants, recreational users and agriculture (Persson 2003). Additionally, higher car traffic volumes are caused by commuting riders (Neuwirth and Penker 2005; Elgåker, Pinzke, Lindholm, and Nilsson 2010).

Research objective

Listening to scholars and commentators in workshops and discussion rounds of project meetings and conferences, many stories are told about the growing agricultural phenomenon of horsekeeping, particularly at urban fringes of metropolitan areas in the Western world. But when browsing the scientific databases, astonishingly little peer-reviewed research literature is available. Here and there the expansion of keeping horses is under debate as a major land use development, particularly in peri-urban area, but argumentation is hardly based on empirical evidence. Therefore, the objective of this article

is to contribute some empirical knowledge to the scientific debate. The main aims are to gain insights into the internal structure of the horse husbandry scene. Further, these results shall be integrated into the wider context of peri-urban development. Addressing these aims, three research questions have been raised to be answered through the research results presented here: (1) Which types of horsekeepers can be differentiated? (2) How is the peri-urban location evaluated by farmers and how do spatial distances to the urban area and the farm type influence the evaluation? (3) What is the value of horsekeeping for the peri-urban development?

Methodology and case study

Case study area

The case study region is located in the German Federal state of Brandenburg and encompasses the 66 municipalities around Berlin. As delineation, the border of the so-called sphere of mutual influence (engerer Verflechtungsraum) was used, which had been normatively defined by the regional planning authorities to control urban growth (MIL 2002). Together with the capital city of Berlin, this area constitutes the core area of Berlin-Brandenburg Metropolitan Region. Some major cities such as Potsdam, Oranienburg, Falkensee and Bernau are located there. It encompasses an area of about 4834 km², which is about 16.4% of the area of Brandenburg and is populated by 1.035 million inhabitants in 2010, growing annually by about 1% during the last 10 years (Amt für Statistik Berlin-Brandenburg). According to own calculations based on Corine Land Cover 2000, about 15% of the area is used for settlement and infrastructure with a majority characterised as suburban.

The 1,327,100 ha agricultural area in Brandenburg consists of 78.1% arable land and 21.5% pastures. Permanent crops play only a marginal role. Of the arable land 53% is used for cereal production, 23% for forage and 15% for oilseeds (MIL 2010). The agricultural orientation in the case study area is comparable. The farm structure is still influenced by its historical, post-socialistic heritage with large farm sizes and the prevalence of juridical enterprises (Gross 1996). Compared to the German average, a rather large-scale farm structure with an average 198 ha agricultural area per holding in 2007 was found (MIL 2010). Particularly, the 11.3% large co-operatives of beyond 500 ha per holding operate on 69% of the agricultural land. Tenure of land is particularly prevalent with 79.3% of the agriculture areas. Due to low qualities of soils, consisting mainly of sand and clay as well as extensive wetland and peat bog, farming in the region has to deal with less-favoured conditions. Hence, approximately 35% of the agricultural area had been subject to financial support.

In Brandenburg, horsekeeping does not look back on a long tradition. Before the fall of the wall, breeding and holding of horses represented a marginal activity in agriculture. At that time, the productivist and industrial schemes with very large, output-oriented farm co-operative dominated the agricultural structure. It is little surprising that 84% of the farms, which participated in our survey, established the horsekeeping activity after 1989. Nowadays, horsekeeping is acknowledged as an important economic factor for the rural development and tourism of the region (MIL 2008). According to the estimations of the Brandenburg Ministry for Agriculture (MIL 2008), the number of horses increased to approximately 34,000 horses in 2007 in the entire federal state of Brandenburg. From an extrapolation of our survey, we assume that at least 10,000 to 15,000 of them are located in the case study region. Figure 1 shows the municipalities of origin of all horsekeepers included in the survey as an indication of the general spatial distribution. There is a concentration of farms close to the city border as well as in proximity to other major cities

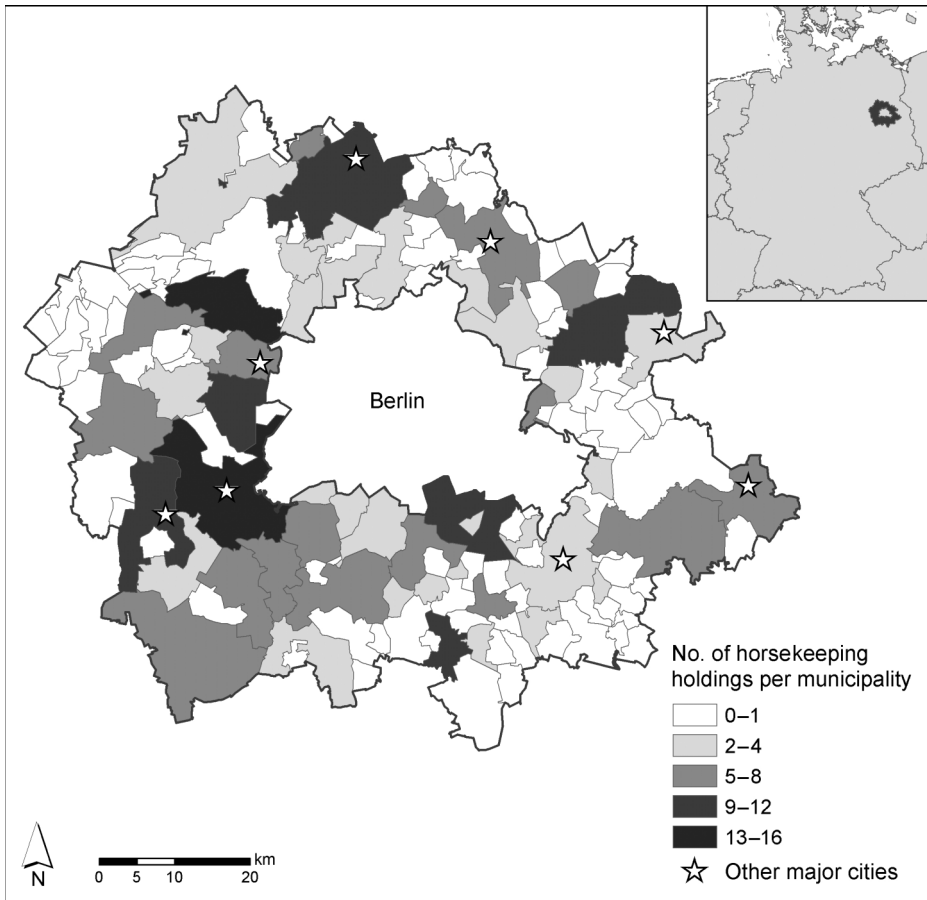


Figure 1. Horse farms around Berlin. Data source: Landesverb and Pferdesport Berlin-Brandenburg and Verband der Freizeitreiter, own illustration.

in the region. Further, horsekeeping farms are also frequent to the west and southwest of Berlin, a part of the case study region which is characterised by higher incomes and employment.

Questionnaire survey

The empirical study is based on a questionnaire survey of horsekeeping farmholders in the case study area. Farm-specific data are not available from the agricultural authorities due to data protection reasons. In addition, the coverage of those holdings, whose status are not considered as legally agricultural, was required, because hobby farmers and specialised equine service enterprises also hold horses. Therefore, we based our sample on a list of members of both the regional horse sports association (Landesverband Pferdesport Berlin-Brandenburg) and the horse riding association (Verband der Freizeitreiter). Together, we obtained a sample size for the case study of 330 horsekeepers including professional enterprises as well as hobby farmers. Based on in-depth interviews with experts from the horse sports association and the Brandenburg Ministry for Agriculture (MIL), we compiled

and pre-tested a questionnaire, which includes key themes on socio-economic characteristics, including age, education, legal status of the holding, type of occupation, income contribution from horsekeeping and farm management. Further questions addressed the farmholders' attitudes on the peri-urban framework conditions, strengths and weaknesses, opportunities and threats. The questionnaire was sent out by postal mail in May and June 2010, obtaining a final response rate of 18% ($N = 59$). Responses to the questionnaires were further processed using the statistical software SPSS (version 12.0.1, IBM, Armonk, New York, USA). Based on the socio-economic indicators of farmholder and farm structure, four different horsekeeping farm types have been identified by applying two-step cluster analysis. With the delineation into classes of farms, we applied analysis of frequencies and cross-tabulation with variables on their evaluation of the peri-urban framework condition and provision of multiple functions and values. Non-parametric testing has been carried out to measure significance levels.

Results

Types of horsekeeping farms

The cluster analysis of the holdings resulted in a differentiation of four generic types of farms: the *diversified traditional farm*, the *extensive horse-oriented farm*, the *hobby farm* and the *intensive equine service farm*. Table 1 shows an overview of the four different farm types with its distinctive characteristics, defined by the cluster centroids.

Traditional farms, which have diversified their agricultural activities into horsekeeping or breeding, represent the most frequent type of holding (34%). This farm type is characterised by an agricultural status, large farm sizes and long tradition in farming. The prevalence of extensive pasture areas indicates traditional farm activities in grazing animal husbandry, such as cows and sheep. They are employment intensive with full-time work orientation. The equine activities clearly represent a diversification measure. Seventy-five per cent of the holdings had a farming tradition before they diversified their activities into horsekeeping. Farmholders mainly see horsekeeping as an additional source of income (75%) and a guarantee for employment until retirement (50%). In this context, it is important to note that a majority of 70% of the cases foresee succession problems. Due to their area potential, these farms typically rear large numbers of horses (average 45, but up to 135). Still, the stocking densities are comparably low as they possess large area of pasture land. Half of the holdings put less than one horse per hectare. The second farm type, representing 29% of all cases, is labelled as *extensive horse-oriented farm*, which is not found in the direct urban fringe, but within a distance of 10–20 km. On comparably large pasture areas, these farms feature medium stocking rates of 1.7 horses per hectare. The main difference to the previous type is that the large majority (94%) established the farm activity with a horsekeeping purpose. They look back on a rather long tradition of horsekeeping, have an agricultural status and own their land. A majority of holdings are run on part-time (65%) or hobby (29%) basis. Farmholders are aged over average (54 years) and 76% live on the farm. As the third type, hobby farmers represent the most atypical farm type. They usually do not aim at income and employment generation, but they are rather leisure and self-fulfilment oriented. There are only 0.8 full-time work equivalents per holding, land tenure is very common (56% exclusively tenancy, 22% exclusively ownership) and specialisations are hardly developed. Therefore, they are not considered officially as agricultural enterprise. Hobby horsekeepers represent a comparably new phenomenon in the Berlin peri-urban area (15 years on an average). The intensity of the land use is very low in different respects. Numbers (10.4) and densities (1.3 per ha) of horses are under average. Also

Table 1. Main characteristics of horsekeeping farm types.

	Diversified traditional farm	Extensive horse-oriented farm	Hobby farm	Intensive equine service farm
	(N = 20; 34%)	(N = 17; 29%)	(N = 9; 15%)	(N = 13; 22%)
Average time of farming (in years)	35.1	20.4	14.2	16.1
Average time of horsekeeping (in years)	18.1	20.2	15.4	17.1
Farm existence before horsekeeping	Mainly yes	Mainly no	No answer	No answer
Average age of farmer (in years)	48.5	54.0	50.1	45.4
Living on farm	Partly	Mainly yes	Partly/no answer	No/no answer
Succession arranged	Mainly no	Mainly yes	Mainly yes/no answer	Mainly no/no answer
Employment in horsekeeping	Mainly full time	Mainly part-time	Hobby	Mainly part-time
Average employment on the farm (in full-time equivalents)	2.5	1.7	0.8	2.3
Average number of horses	45.2	22.7	10.4	18.7
Average pasture area (in ha)	40.4	18.9	7.7	2.1
Average stocking density (in horse/ha)	1.4	1.8	1.3	9.2
Legal agricultural status	Yes	yes	no	no
Receiver of financial aid for pasture areas	Partly/all areas	Partly/no area	No answer	No answer
Property situation	Ownership/tenancy	Mainly ownership	Mainly tenancy	Mainly tenancy
Distance to Berlin (0 = Berlin; 1 = 0–10 km; 2 = 10–20 km; 3 = >20 km)	2.2	2.7	2.9	1.8

Data source: Own survey.

hobby farmers are found rather at the outer fringe with a distance of 10–20 km. Similar to the second farm type, the *intensive equine service farm* type is characterised by its particular focus on the horsekeeping activity. But in contrast, it is highly intensive in terms of employment (2.3 full-time equivalents per holding) and utilisation of very limited farm land (2.1 ha pasture land; 9.2 horses per ha). The majority of 77% of the cases are located within the first 10 km from the city border.

Peri-urban location

The results of the survey have shown the tendency that farmers highly value the peri-urban location of their holdings. There is a general tendency across all types of farms and location within the peri-urban area to emphasise the strengths and potentials and underrate the weaknesses and threats. On the one side, high average values have been observed for ‘good accessibility’ and ‘proximity to the city’. Both have even been considered as important criteria for the establishment of the horsekeeping activity on the farm. ‘Medium-term land competition with other non-agricultural land use’, ‘conflicts with neighbouring land use’ and ‘legal restrictions’ on the other side are evaluated less important. We also analysed the

dependency of the farmer's evaluation of the peri-urban framework conditions based on their location in terms of distance to the city border of Berlin. Therefore, four classes of distance have been assembled (within Berlin, <10 km, 10–20 km and >20 km). Looking at the average evaluation within each class, we found an urban–rural slope within the evaluation pattern for some variables. The agreement for 'good transportation situation' and 'importance of urban proximity for horsekeeping activity' drop from 4.2 and 4.7 inside Berlin to 2.4 and 2.8 in locations beyond 20 km distance. Average values for 'land competition with non-agricultural land use' and 'high land prices' also decrease with further distances from 2.7 and 4.2 to 1.3 and 2.4. For most of the variables, the significance level is low. Only 'urban proximity important for horsekeeping activity' (0.01), 'higher land prices than in comparable rural areas' (0.00) and 'land purchase limitations due to high land prices' (0.09) can be distinguished significantly by distance. For other value distributions, the explanatory power is limited.

We furthermore analysed the dependency of the evaluation of the peri-urban framework conditions based on the affiliation to a horsekeeping farm type. In contrast to the distance-related analysis, we obtained significant results for a majority of variables, indicating relevant influence (see Table 2). The perspective of *diversified traditional farmers* onto the peri-urban location reveals an appreciation of the infrastructure situation in general (4.6). Seventy-five per cent of the farmholders of this type completely agree that infrastructure accessibility is important for the horsekeeping diversification. The actual quality of infrastructure is assessed as medium (3.2). Concerning deficits, limited area expansion opportunities (4.4) and oversupply with equine service providers (3.9) are highlighted. In return, conflicts with residential neighbours (2.5) and competition with non-agricultural land uses (1.9) play a minor role. The *extensive horse-oriented farm* generally responds less sensitively regarding the advantages and disadvantages of the peri-urban area. Especially land competition threat (1.9), level of conflicts with neighbours (2.3), legal restrictions (2.5) and rental contracts (1.7) are of marginal concern; 56% do not agree that short rental contracts represent a problem for horsekeeping within the peri-urban area. Hobby farmers tend to recognise only little advantage of the proximity to urban areas. For all variables, the values are under average. As they operate farming activities on a non-economically driven basis, this is particularly the case for the importance of infrastructure accessibility (3.4) and urban proximity (3.3). Whereas over-average limitations for expansion (4.3) are seen, high land prices (2.0) and short rental contracts (1.9) represent less-urgent issues. Farmers who run an *intensive equine service farm* are most sensitive in evaluating the peri-urban framework conditions. Ninety-two per cent of all cases agree with the importance of accessibility, proximity to the city and the related urban demand. They also highly value the actual situation of infrastructure availability (4.2) and existing demand (4.3). At the same time, the urban pressure in terms of high land prices (4.1), limited expansion possibility (4.0) and land competition with non-agricultural land uses (3.3) is well noticed.

Peri-urban development perspectives

As we could see, the horsekeeping farm sector in the case study region is rather heterogeneously structured. Hence, one can assume that the particular types of farm holdings contribute differently to peri-urban development – in terms of multiple functions and values. Socio-economic development, environment and nature protection, maintenance of the cultural landscape and education, leisure and tourism represent important elements of the peri-urban development. Accordingly, the analytical framework of the study outlined in

Table 2. Peri-urban location from the horsekeeper's perspective.

Peri-urban characteristics ^{a,b}	Diversified traditional farm	Extensive horse-oriented farm	Hobby farm	Intensive equine service farm	Total	Significance ^c
Strengths and opportunities						
Infrastructure situation	3.2	3.6	3.4	4.2	3.6	n.s.
Urban demand situation	3.5	3.6	3.1	4.3	3.6	n.s.
Importance of urban proximity	4.2	3.7	3.3	4.6	4.0	n.s.
Importance of accessibility	4.6	4.6	3.4	4.9	4.5	0.04**
Importance of urban demand	3.5	3.6	3.1	4.3	3.6	0.00**
Weaknesses and threats						
Limited expansion	4.4	3.0	4.3	4.0	3.9	0.03**
High land prices	3.6	3.4	2.0	4.1	3.4	0.04**
Competition non-agricultural land use	1.9	1.9	3.3	3.3	2.4	0.00**
Neighbourhood conflicts	2.5	2.3	2.9	2.8	2.6	n.s.
Legal restrictions	2.8	2.5	3.0	2.8	2.7	n.s.
Short rental contracts	2.8	1.7	1.9	3.2	2.4	0.02**
Oversupply competition	3.9	3.5	3.3	3.0	3.5	0.09*

Data source: Own survey.

^a1 = not agree; 2 = less agree; 3 = neutral; 4 = more agree; 5 = fully agree.

^bMedium values within classes.

^cn.s., no significance; * $p < 0.1$; ** $p < 0.05$.

Figure 2 integrates farmers' behaviours and attitudes towards aspects, such as the economic activities and specialisations, employment and income, land management systems, landscape management measures as well as fodder production and purchase.

Some general results are obtained from the survey. Regarding the economic development, we found a high degree of professionalisation and primary income orientation; horsekeeping as a diversification strategy is obviously underrepresented. Commonly, farms had been established under a horsekeeping purpose. On an average, 1.5 horses are kept per hectare and besides marginal exceptions they are kept on pastures. If necessary, the overwhelming majority makes sure that the purchased fodder is of regional origin (71%) and has a high share of raw fibre (85%) and herbs (67%). Forty-seven per cent of the horsekeeping farms implement agri-environmental measures, basically as extensive pasture management. Pesticides are applied by 19% of the farms, 42% apply regularly lime and 62% use fertilisers. However, broken down to the farm types, we obtained a rather

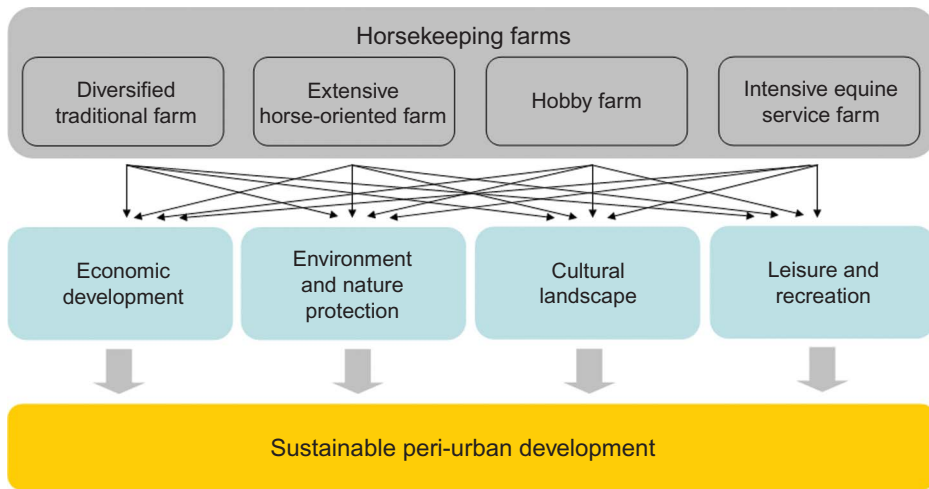


Figure 2. Analytical framework. Data source: Own illustration.

differentiated picture. Table 3 shows the main activities and behaviour characteristics as the farm contributes to the development of a peri-urban countryside.

Mainly, already experienced in grazing animals husbandry of other kind, the diversified traditional farm established horsekeeping as an on-farm diversification activity as an additional contribution to income generation. They show a clear economic motivation to make use of the increasing urban demand. They are characterised by a strong ecological and landscape contribution. Through large average farm sizes and more remote locations, these farms commonly can apply extensive agri-environmental measures. Together with the operation in nature protection areas and less-favoured areas, they contribute to the maintenance of the habitats and cultural landscape. They also keep less-productive farmland in operation. On the one hand, they emphasise nature-friendly management methods, such as late mowing and regional-specific grass composition. On the other hand, the application of fertilisers, lime and pesticides is over average. *Extensive horse-oriented farms* typically provide a rather large spectrum of services related with horsekeeping, including horse accommodation and rental as well as farm tourism offerings. Little less common are social and educational services, such as riding schools and therapies. These enterprises are operated as specialised and economic-oriented equine services. Despite that, the horsekeepers highlight their strong environmental consciousness, but only one out of four implement agri-environmental measures. A high share of herbs and grasses is seen as important for their own fodder production. Run only for the leisure purposes of the owner, hobby farms hardly contribute to employment and income generation of the peri-urban farming community. Nevertheless, as they frequently cultivate former set aside land, they play a relevant role in the development of the cultural landscape. With their very extensive farm management approach, including low degrees of fertilising, liming and pesticide loads, they maintain cultural landscape and protect nature and environment. The perspectives of *intensive equine service farms* look different. Their marginal farm sizes do not allow strong spatial impact on the landscape. They neither grow their own fodder, nor do they apply landscape measure of some kind. According to the farmers' responses, they pay least attention to the regional origin of the purchased fodder. These farms' value for the peri-urban development derives from their socio-economic importance related to their

Table 3. Contribution of farm types to the peri-urban development.

Diversified traditional farm	
-	Horsekeeping as diversification measure**
-	Large number of horsekeeping activities and specialisations**
-	Common cultivation in nature protection areas (50%)
-	Implementation of agri-environmental measures (35%)*
-	Over average application of fertilisers (70%), lime (25%)* and pesticides (25%)
-	Cultivation in least favoured area (60%)**
-	Common late mowing (58%)
-	Regional-specific grass composition among own production (76%)
Extensive horse-oriented farm	
-	Large number of horsekeeping activities (65% horse pension, 28% tourism & horse-rental service)**
-	Social and educational services (28% therapy services)**
-	Environmental consciousness (77%)
-	Implementation of agri-environmental measures (24%)*
-	High share of herbs (71%) and grasses (100%) among own production
-	Regional species composition in purchased fodder (71%)
Hobby farm	
-	Low degree of economic activities**
-	Maintenance of land cultivation (> 50% on previously set aside area)
-	Environmental consciousness (67%)
-	Low application of fertilisers (56%), lime (11%)* and pesticides (11%)
-	Seldom building construction (14%)
-	No implementation of agri-environmental measures*
-	High share of herbs (87%)** and raw fibre (100%) in purchased fodder
Intensive equine service farm	
-	Alternative to housing development (57% expect conversion threat)
-	Income and employment oriented**
-	Leisure service provider (85% horse pension)**
-	Social and educational services (62% therapy services)**
-	Over average application of fertilisers (77%), lime (33%)* and pesticides (11%)
-	Located close to the city (77% within a distance of 10 km from the city border)
-	No implementation of agri-environmental measures*
-	No own fodder production
-	Importance of regional origin of purchased fodder (83%)

Note: * $p < 0.1$; ** $p < 0.05$.

Data source: Own survey.

income and employment intensity. Beyond typical horse accommodation business they offer a multitude of equine services from leisure to education and therapy. Due to a strong economic motivation and a high degree of specialisation, they can be considered as professional leisure service provider, rather than a regular agricultural holding. The concentration of intensive equine service farms close to the city confirms their dependency on consumer accessibility. They require open farmland and provide a reasonable economic alternative to housing development.

Discussion

The research findings discussed here are based on a questionnaire survey among 59 horsekeeping farmers in the peri-urban area around Berlin. The small sample size

and response rate require careful interpretation regarding the suitability to allow general conclusions about the horsekeeping in the case study area and elsewhere. To reveal the peri-urban specifics, a research extension into a comparable remote rural area would contribute to the identification of characteristic differences. Yet, the following discussion and conclusions aim at giving answers to the previously formulated research questions.

Horsekeeping farm types

Horsekeeping activities are seen as a continuing trend in the farming communities around metropolitan areas, leaving open questions regarding the evaluation in terms of impacts on landscape and sustainable development of the peri-urban fringes. Therefore, it is very important to highlight that there is not at all such a thing like *the* horsekeeping farm. Instead, our empirical survey has indicated that this phenomenon needs to be carefully differentiated. In accordance with the Swedish results of Planck (2000), we identified in our case study region around Berlin four distinctive types of horsekeeping farms, characterised by the socio-economic background of the farmholder, farm size and structure as well as the extent and intensity of horsekeeping. We found regular, traditional farms, which made use of the existing pasture land seeking additional source of income, safeguarding farm survival. Other farms have been established on horsekeeping purpose, but show intensity differences in horsekeeping. Some of those are even more similar to other leisure facilities at the urban fringe, such as tennis centres or sports halls. Not least, a relevant share of hobby farmers, private persons keeping horses, riding clubs and so forth have been found. They tend to be small in size and less intensive in management as these farms hardly follow economic objectives. One might easily understand that this diversity plays an important role for the assessment of impact, regulation and support measures in peri-urban planning and policy.

Peri-urban location

The farmers' evaluation of the peri-urban area as an environment to keep horses has shown that there is a clear tendency to appreciate the advantages of the proximity to and accessibility of the urban area nearby, with its concentration of demand from affluent, leisure and lifestyle-oriented people. It is expressed by the respondents that these peri-urban framework conditions represent economically necessary requirements to run horse-related activities. In return, disadvantages and urban pressures, for example, limited availability and competition for land or conflict situation, are considered less dramatic. It contrasts other research results (Ravenscroft and Long 1994; Elgåker and Wilton 2008), which stress the attachment of horsekeeping with a multitude of neighbourhood conflicts. This contradiction might be justified by the low degree of concentration of horsekeeping activities and farms compared to other regions. Still, it is clearly indicated that with increasing adjacency to the city, conflicts and operational constraints are seen as more critical, particularly high land prices and competition with other non-agricultural land uses. The inclusion of the farm type delineation into the evaluation analysis has proven meaningful. Significant differences within the evaluation pattern were observed. The varying perspectives of farmers on the peri-urban environment can be explained by differences in aims and motivations of the farm types, which have a major influence on the requirements for their farming business. Hobby farmers do not follow any economic approach of generating additional income from the horsekeeping activity. Thus, they are simply not affected by whether or not horse riders can easily reach their farm, except themselves. In contrast, farms that have

specialised on horsekeeping as the main occupation respond much more sensitively on the availability and accessibility of potential urban consumers. Also, conflicts with neighbours and legal constraints appear much more frequent on intensive equine service farms, caused by noise, odour and aesthetic insufficiencies of heavily used paddocks and stables as well as car traffic from visitors.

Contribution to the peri-urban development

Like other agricultural activities, horsekeeping too contributes on different levels to the rural development – the economic rural development, the protection of nature and environment, the maintenance of the cultural landscape as well as to the leisure and recreational capacity. Depending on their activities and management schemes, the different types of farms deliver different values and functions for the countryside around urban areas.

Horsekeeping in the region is characterised by a high degree of specialisation. Only to some extent, it also represents a diversification strategy. As a response to prevalent urban demand, farms often have been newly established to provide adequate equine service offers. The most common horse accommodation and rental, riding schools and also therapeutic services are directly aimed at an urban public. Activities like horse pensions have been recognised earlier as particularly income relevant (Schöner 2005). Employment and income generation represents another relevant aspect, as the large share of holdings with main occupation in agriculture and horsekeeping indicates. The research results at hand have additionally raised another point: horsekeeping might represent an opportunity to keep less-favoured areas in utilisation. This is especially the case for *diversified traditional* and *hobby farms*. In this sense, the research results of Bailey *et al.* (2000) are confirmed. For the less-productive pasture areas, horsekeeping represents an economically reasonable alternative to cattle husbandry or even the setting aside of farmland.

Regarding the environmental impacts, horsekeeping has to be seen as ambivalent. On the one hand, it represents a very extensive type of land use due to low livestock unit densities, more extensive than cattle husbandry or arable land use. The pasture management has to correspond to the roughage fodder requirements of horses. It includes a high share of herbs and low levels of fertilisers and pesticides, which is in conformity with nature protection objectives. Grasses are mown late, encompass a high diversity of plant species and have a region-specific composition of grass types. Particularly the large-scale farms commonly operate in nature protection zones and implement agri-environmental measures. On the other hand, a concentration of intensive equine service farms has been recognised at the urban fringe. With their high horse stocking rates, environmental impacts already connected to horsekeeping (Elgåker and Wilton 2008) need to be assumed. With average 9.2, but up to 52 horses per hectare, grazing overuse, high pesticide loads and large manure amounts would not surprise to negatively affect the environment.

Based on the research results, horsekeeping can be seen as type of land use, which to a large extent contributes to the maintenance of the cultural landscape. Pastures and horses represent important elements of the open landscape. Pasture land, especially in less-favoured areas like in this case study area, is kept in operation through horsekeeping. Particularly, hobby farmers additionally tend to keep redundant farm buildings in use. Moreover, it was found that more farms participate in landscape management measures than the average for the whole region of Brandenburg. From an aesthetical perspective, the evaluation depends more on the degree of concentration. Destroyed turfs, accumulation of fenced paddocks and density of stables are rather detrimental to the visual landscape appearance. Therefore, a similar divide of the farm types is necessary for the environmental

impacts – the extensive and hobby farms, on the one side, and the intensive equine specialists, on the other side. However, a general positive appraisal that horses (and horsekeeping farms) play an important role to maintain cultural landscape as Neuwirth and Penker (2005) as well as Liljenstolpe (2009) concluded can be agreed. However, there is some controversy, about to which extent the expansion of horsekeeping activities can be considered as a favourable land use development (see Bomans *et al* 2010). The differentiation of types of horsekeeper yields some clarification, as they show how heterogeneously the horsekeeping community is structured. Whereas the intensive service provider is more similar to other non-agricultural leisure facilities at the urban fringes, horsekeeping at diversifying and extensive pasture farms represents an important contribution to a viable farming community.

Horse riding represents a growing outdoor activity in peri-urban areas. Hence, horsekeeping farms contribute to the countryside's capacity to perform recreational activities. It was found that farm tourism diversification is marginal, which might be justified by the peri-urban location as the adjacency to the city counteracts the tourism purpose, for which people seek remoteness and prefer rural areas instead. Regarding the horse riding itself, Persson (2003) put forward the multitude of conflicts with other recreational activities, such as cycling and hiking as they often use the same tracks and paths. But according to the horsekeepers' perspectives, these conflicts are not common in the case study area.

Conclusion

Answering the first research question, we have revealed that the horsekeeping sector is very heterogeneously structured. Four characteristic horsekeeping farm types have been identified in our case study area. They are basically distinguished by motivation and intensity of horsekeeping. This differentiation should carefully be taken into consideration for impact assessment and policymaking for agriculture and rural development. Responding to research question two, it is concluded that the peri-urban framework conditions are generally positively evaluated by farmers. The distance to the city and more significantly the affiliation to a farm type represent influential factors for the farmers' attitude. Addressing the last question, it can be concluded that the entirety of the diverse horsekeeping farms contributes to some extent to a multifunctional peri-urban development, although many of them are not very multifunctional themselves. Many are either highly specialised on one activity, like horse accommodation, or the horsekeeping serves solely the pleasure and well-being of the farmholder. But in their sum, they have the potential to make a contribution to environmental protection and the maintenance of the cultural landscape. They also represent a highly relevant economic activity, ensuring farm survival in an urban stressed and pressured agricultural environment.

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References

Amt für Statistik Berlin-Brandenburg (State Statistical Institute Berlin-Brandenburg), (2011), <http://www.statistik-berlin-brandenburg.de/>.

- Bailey, A., Williams, N., Palmer, M., and Geering, R. (2000), "The Farmer as Service Provider: The Demand for Agricultural Commodities and Equine Services," *Agricultural Systems*, 66, 191–204.
- Bomans, K., Steenberghe, T., Dewaelheyns, V., Leinfelder, H., and Gulinck, H. (2010), "Underrated Transformations in the Open Space - the Case of an Urbanized and Multifunctional Area," *Landscape and Urban Planning*, 94, 196–205.
- Bruns, D., Ipsen, D., and Bohnet, I. (2000), "Landscape Dynamics in Germany," *Landscape and Urban Planning*, 47, 143–158.
- Cavailles, J., and Wavresky, P. (2003), "Urban Influences on Periurban Farmland Prices," *European Review of Agricultural Economics*, 30, 333–357.
- Cazaux, G., Carels, K., and Van Gijsegem, D. (2007), *Prospects and Challenges for Agricultural Diversification in a Peri-urban Region (Flanders – Belgium)*, Brussels: Vlaamse Overheid, Beleidsdomein Landbouw en Visserij.
- Dockered, D. (2000), "Hästen – En Resurs I Dagens Samhälle," *K.Skogs-o.Lantbr.Akad.Tidskr.*, 134(4), 9–11.
- Elgåker, H. (2011), "Horse Keeping in Peri-urban Areas," Ph.D. dissertation, Swedish University of Agricultural Sciences.
- Elgåker, H., Pinzke, S., Lindholm, G., and Nilsson, C. (2010), "Horse Keeping in Urban and Peri-urban Areas: New Conditions for Physical Planning in Sweden," *Danish Journal of Geography*, 110, 81–98.
- Elgåker, H., and Wilton, B. (2008), "Horse farms as a factor for development and innovation in the urban-rural fringe with examples from Europe and Northern America." in *Proceedings from 10th Annual Conference, Nordic-Scottish University for Rural and Regional Development*, pp. 43–55.
- Gibon, A. (2005), "Managing Grassland for Production, the Environment and the Landscape. Challenges at the Farm and the Landscape Level," *Livestock Production Science*, 96, 11–31.
- Gross, N. (1996), "Farming in Former East Germany: Past Policies and Future Prospects," *Landscape and Urban Planning*, 35, 25–40.
- Heimlich, R.E., and Barnard, C.H. (1997), "Agricultural Adaptation to Urbanization: Farm Types and Agricultural Sustainability in U.S. Metropolitan Areas," in *Rural Sustainability Development in America*, ed. I. Audirac, New York: Wiley and Sons, pp. 283–303.
- Ilbery, B.W. (1991), "Farm Diversification as an Adjustment Strategy on the Urban Fringe of the West Midlands," *Journal of Rural Studies*, 7, 207–218.
- Ilbery, B.W., Healey, M., and Higginbottom, J. (1997), "On and Off-Farm Business Diversification by Farm Households in England," in *Agricultural Restructuring and Sustainability: A Geographical Perspective*, eds. B. Ilbery, Q. Chiotti and T. Rickard, Wallingford: CAB International, pp. 135–151.
- Liljenstolpe, C. (2009), *Horses in Europe*, Uppsala: Swedish University of Agricultural Sciences, 27 pp.
- MiL. (2002), *Gemeinsamer Landesentwicklungsplan Für Den Engeren Verflechtungsraum Brandenburg-Berlin*, Potsdam: Ministerium für Landwirtschaft, Umweltschutz und Raumordnung.
- MiL. (2008), *Agrarbericht 2008 Des Landes Brandenburg*, Potsdam: Ministerium für Ministerium für Infrastruktur und Landwirtschaft des Landes Brandenburg.
- MiL. (2010), *Agrarbericht 2010 Des Landes Brandenburg*, Potsdam: Ministerium für Ministerium für Infrastruktur und Landwirtschaft des Landes Brandenburg.
- Munton, R. (2009), "Rural Land Ownership in the United Kingdom: Changing Patterns and Future Possibilities for Land Use," *Land Use Policy*, 26, S54–S61.
- Neuwirth, J., and Penker, M. (2005), "Regionalökonomische Effekte Der Pferdehaltung Im Mittleren Wienerwald," in *Jahrbuch Der Österreichischen Gesellschaft Für Agrarökonomie*, ed. K. Pistrich, Wien: Facultas, pp. 191–206.
- Newsome, D., Cole, D.N., and Marion, J.L. (2004), "Environmental Impacts Associated with Recreational Horse-Riding," in *Environmental Impacts of Ecotourism*, ed. R. Buckley, Wallingford: CAB International, pp. 61–82.
- Newsome, D., Smith, A., and Moore, S.A. (2008), "Horse Riding in Protected Areas: A Critical Review and Implications for Research and Management," *Current Issues in Tourism*, 11, 144–165.
- Otte, U. (1994), "Freizeitreiten - Chance Oder Belastung? Artgerechte Pferdehaltung Als Alternative Für Landwirte," *Naturschutz Und Landschaftsplanung*, 26, 32–35.

- Persson, H. (2003), "Planering för tätortsnära ridning – mer än bara ridhu," Special Meddelande No.244, Alnarp, Swedish University of Agricultural Sciences, Department of Agricultural Biosystems and Technology, 144 pp.
- Piorr, A., Ravetz, J., and Tosics, I. (eds.) (2011), "Peri-urbanisation in Europe: Towards a European Policy to Sustain Urban-Rural Futures," A Synthesis Report. Frederiksberg: University of Copenhagen/Academic Books Life Sciences.
- Planck, C. (2000), "Lantbruksföretag Med Hästhållning," *K.Skogs-o.Lantbr.Akad.Tidskr.*, 134(4), 33–39.
- Ravenscroft, N., and Long, H.A.R. (1994), "Horses in the Countryside: Conflict or Co-operation?," *Journal of the Royal Agricultural Society of England*, 155, 79–86.
- Rook, A.J., and Tallwin, J.R.B. (2003), "Grazing and Pasture Management for Biodiversity Benefit," *Animal Research*, 52, 181–189.
- Schaller, A. (1995), *Pferdehaltung im ländlichen Raum und ihre Bedeutung für Mensch und Umwelt*, Munich: Technical University Munich.
- Schöner, C. (2005), "Pensionspferdehaltung in Großstadtnähe - Eine Chance Für Die Landwirtschaft? Das Beispiel Der Landkreise Erlangen-Höchstadt Und Forchheim," *Mitteilungen Der Fränkischen Geographischen Gesellschaft*, 52, 99–113.
- Seifert, C., Sperle, T., Raddatz, J., and Mast, R. (2005), *Dokumentation Und Handreichung Zur Biotoppflege Mit Pferden*, Stuttgart: LUBW Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg.
- SLU (2001), *The Horse Industry in the European Union. Final Report, EU Equus (2001)*, Uppsala, Sweden: Sveriges lantbruksuniversitet.
- van der Ploeg, J.D., and Roep, D. (2003), "Multifunctionality and Rural Development: The Actual Situation in Europe," in *Multifunctional Agriculture. a New Paradigm for European Agriculture and Rural Development*, eds. G. Van Huylenbroeck and G. Durand, Aldershot: Ashgate, pp. 37–53.
- Zasada, I. (2011), "Multifunctional Peri-urban Areas – a Review of Societal Demands and Agricultural Provision of Goods and Services," *Land Use Policy*, 28(4), 639–648.
- Zasada, I., Fertner, C., Piorr, A., and Nielsen, T.S. (2011), "Peri-urbanisation and Multifunctional Agriculture around Copenhagen, Denmark," *Geografisk Tidsskrift-Danish Journal of Geography*, 111(1), 59–72.

Paper V

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Peri-urban Adaptation Strategies of Horticultural Farms in the Berlin Metropolitan Area

Ingo Zasada

Introduction

Horticulture in Peri-urban Areas

Historically, cities depend heavily on food supplies from the surrounding countryside. Following the large-scale, spatial de-coupling of production-consumption-chains, there has recently been a surge in urban preferences for regional high value and fresh products, particularly from horticulture, reflecting higher standards of living, health and environmental awareness¹. Today, on the fringes of numerous Metropolitan areas, you can find green belts such as the '*Ceinture verte*' outside Paris or the '*Huerta*' in Valencia, which specialise in horticulture and high-value crop production like vegetables, herbs, fruit and ornamental plants². The importance of location in agricultural production, as defined by its distance to a central city (as already described in the classic model by Von Thünen)³, is experiencing a renaissance.

However, horticulture in peri-urban areas is faced with specific challenges, characterised by urban pressure and opportunities, which require adapted activities. As urban growth occurs almost exclusively on farmland, fertile land is lost and the number of farms decreases. In addition, when urban areas and agriculture are in close contact, multiple tensions and conflicts arise, such as vandalism, theft and trespassing, as well as legal restrictions. In peri-urban areas, farming has to compete on the land market with non-agricultural land uses and higher rents, land speculation⁴ and complex, fragmented ownership patterns and property rights, such as short-term contracts⁵. On the other hand, urban agglomerations also provide specific development opportunities, particularly for high-value horticultural crop production. With functioning urban-rural-relationships, accessibility to urban consumers brings with it the comparative advantages of flexible and innovative adaptation to changing demand and the identification of market niches, i.e. organic production⁶. Farm products are more easily marketed directly by farm-gate purchase, farmers' markets or food box networks⁷. Due to their small-scale structure, it is argued, that the horticulture sector in particular requires different modes of marketing as well as strong horizontal cooperation⁸. Diversification into agricultural businesses, non-farming activities and off-farm employment has also been observed in peri-urban areas⁹.

Research Objective

With the catching-up process following the political isolation of Western Berlin, the city has regained its relationship with the peri-urban hinterland, including as a regional food source. Increasingly, horticultural farm owners have adapted their production and marketing to the urban market. However, like farming styles, structures and farm owners' perspectives differ, and adaptation strategies are also highly heterogeneous and mul-

tifaceted within the horticultural sector, as previous research in the area suggests^{10,11}. The aim of this study is to enhance our understanding of farm owners' perspectives and their evaluation of the peri-urban location, and to gain insights into their adaptation strategies and motivation in relation to the immediate context. Moreover, additional knowledge on specific farm-related differences in development trajectories needs to be identified.

Case Study of the Berlin Metropolitan Area

The Berlin Metropolitan area consists of two Federal states, Brandenburg and Berlin. Its central area includes 66 municipalities around Berlin and the city itself. Delineated by the regional planning authorities to control urban growth,¹² this so-called sphere of mutual influence (*engerer Verflechtungsraum*) can be regarded as a peri-urban area. It embraces an area of around 5,400 km² and is populated by about one million inhabitants (2006), that has been steadily growing at a rate of an additional 75,000 inhabitants since 2000¹³. According to calculations based on the Corine Land Cover 2000, about 15% of the area is used for settlement and infrastructure, with the most of the area characterised as suburban.

Farming in the case study area is affected by less favourable conditions of low quality soils, consisting mainly of sand and clay, as well as extensive wetland and peat bog. However, horticulture features a number of cultivation traditions of nationwide importance, such as asparagus, fruit trees and cucumber. In 2005, the Brandenburg agricultural census counted over 800 holdings with primary or secondary occupation in horticulture, with production covering 12,000 ha of agricultural land¹⁴. Although horticulture represents only 0.9% of the total agricultural area and 12% of the total holdings, it accounts for about 20% of the net value added of the entire farming sector, illustrating its economic relevance¹⁵. As figure 1 shows, horticultural production is spatially concentrated in the traditional growing areas of Potsdam-Mittelmark, South-west

1- Zasada (Ingo), "Multifunctional peri-urban areas – A Review of societal demands and agricultural provision of goods and services", *Land Use Policy*, 2011, in press.

2- Péron (Jean-Yves) et Geoffriau (Emanuel), "Characteristics and Sustainable Development of Peri-Urban Vegetable Production in Europe", *Acta Horticulturae*, n°762, 2007, p. 159-170.

3- Von Thünen (Johann H.), *The Isolated State*, Oxford, Pergamon Press, 1966, 304 p.

4- Robinson (Guy M.), *Geographies of agriculture: globalisation, restructuring and sustainability*, Harlow, Pearson, 2004, 331 p.

5- Munton (Robert), "Rural land ownership in the United Kingdom: Changing patterns and future possibilities for land use", *Land Use Policy* n°26, 2009, p. S54-S61.

6- Matzdorf (Bettina) and Piorr (Annette), "Städte nicht links liegen lassen", *LandInForm* n°3, 2010, p. 48-49.

7- Jarosz (Lucy), "The city in the country: Growing alternative food networks in Metropolitan areas", *Journal of Rural Studies* n°24, 2008, p. 231-244.

8- Péron (Jean-Yves) et Geoffriau (Emanuel), *op. cit.*

9- Præstholm (Søren) and Kristensen (Søren P.), "Farmers as initiators and farms as attractors for non-agricultural economic activities in peri-urban areas in Denmark", *Geografisk Tidsskrift*, n°107(2), 2007, p. 13-27.

10- Piorr (Annette) and Matzdorf (Bettina), "Environmental impact assessment of rural development programme of Brandenburg state, Germany", in *Proceedings of the 87th EAAE Seminar Assessing Rural Development Policies of the Common Agricultural Policy*. Vienna, April 21-23, 2004, p. 177-195.

11- Siebert (Rosemarie), Dosch (Axel) and Volgmann (Alexandra), *Arbeit und Einkommen im ländlichen Raum: Chancen durch Diversifizierung*, Potsdam, Ministerium für Infrastruktur und Landwirtschaft des Landes Brandenburg, 2009, 41 p.

12- Ministerium für Landwirtschaft, Umweltschutz und Raumordnung (MLUR), *Gemeinsamer Landesentwicklungsplan für den engeren Verflechtungsraum Brandenburg-Berlin*, Potsdam, Ministerium für Landwirtschaft, Umweltschutz und Raumordnung, 2002, 64 p.

13- Gemeinsame Landesplanungsabteilung Berlin-Brandenburg (GL), *Raumordnungsbericht 2008*, Potsdam, Gemeinsame Landesplanungsabteilung Berlin-Brandenburg, 2008, 134 p.

III. Analyse critique de situations et dispositifs agri-métropolitains

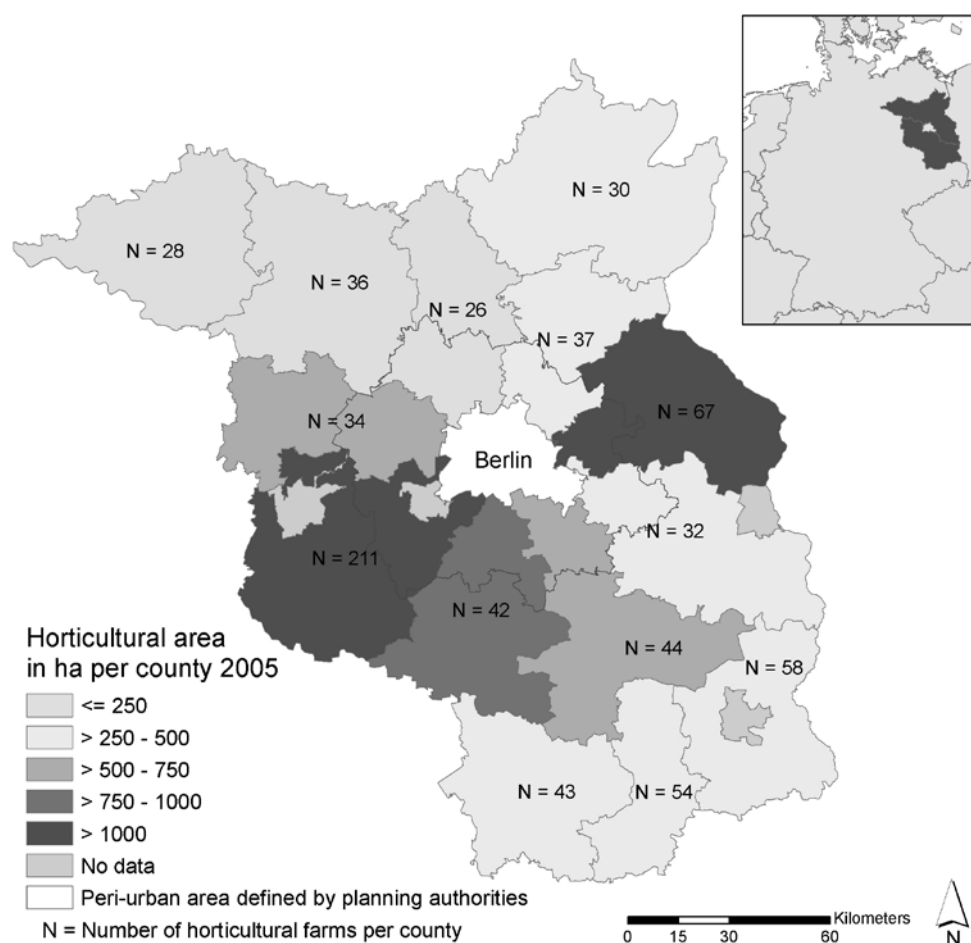


Fig. 1: Number and cultivation area (in ha) of Horticultural farms in Brandenburg per county 2005, Data source: Landesamt für Datenverarbeitung und Statistik Brandenburg, 2006, own illustration.

(36%) and Märkisch Oderland, East of Berlin (17%), both encompassing large parts of the Berlin peri-urban area, although accurate figures are not available¹⁶.

Methodology

To capture in-depth personal insights, this work builds on a qualitative inquiry of a few, very carefully selected prototypical and information-rich cases. This methodology was chosen as the most suitable to explore individual experience and to secure high density information, required for further interpretation¹⁷. To reflect on the presumed heteroge-

neity of the horticultural sector in the region, a maximum variation sampling method, as suggested by Patton¹⁸, is applied to identify recurring and diverging patterns of farm adaptation. Thus, representativeness and generalizability through randomisation and large sample sizes are not the main objective, but rather theoretical saturation through the adequate fit of selected cases¹⁹. Therefore the selection of individual cases is based on the farm-style approach²⁰, which facilitates understanding and operationalization of the heterogeneity of the farmers' socio-economic situations, behaviours and decision-making. This differentiation has already been applied in other Metropolitan areas to explain farm household strategies²¹. Through inductive reasoning from a broad empirical basis of primary agricultural census data, as well as research projects conducted by the Leibniz Centre for Agricultural Landscape Research, we derived a theoretical farm typology framework (see fig. 2). The interviews were carried out with the help of pre-tested semi-structured guidelines to achieve comparability on the thematic issues.

Farm Portraits

On the basis of their characteristics and spatial adjacency to settlement areas, horticultural holdings were selected as representative of a specific farm type. A conventionally producing, larger-scale salad grower was chosen for farm type A. Quite small in size, but with a strong marketing orientation towards neighbouring urban areas, the second holding was chosen to represent the adaptive farm type B. A long-established vegetable grower, who has reduced the size of his production area over time, was regarded archetypically for a phasing-out type C. Finally, type D is represented by a new form of cooperative farming and gardening, which is spreading in and around Berlin. It represents an innovative approach for dealing with the new demands and requirements of urban dwellers and was thus of interest for our study. Figures 3 and 4 show the surrounding land use structure. Table 1 gives an overview of the main structural characteristics of the selected cases.

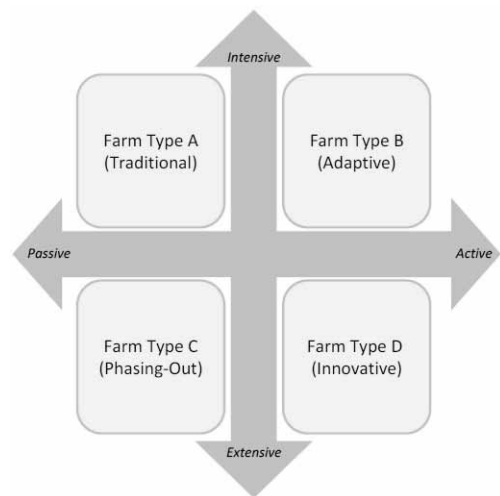


Fig. 2 : Farm Typology Framework, own illustration.

- 14- Landesbetrieb für Datenverarbeitung und Statistik (LDS), *Statistische Berichte – Gartenbauerhebung im Land Brandenburg 2005*, Potsdam, Landesbetrieb für Datenverarbeitung und Statistik, 2006, 71 p.
- 15- Ministerium für Infrastruktur und Landwirtschaft (MIL), *Agrarbericht 2010*, Potsdam, Ministerium für Infrastruktur und Landwirtschaft, 2010, 104 p.
- 16- Landesbetrieb für Datenverarbeitung und Statistik, *op. cit.*
- 17- Attelslander (Peter), *Methoden der empirischen Sozialforschung*, Berlin, Erich Schmidt, 2008, 359 p.
- 18- Patton (Michael Q.), *Qualitative research and evaluation methods*, Thousand Oaks, Sage, 2002, 688 p.
- 19- Bowen (Glenn A.), "Naturalistic inquiry and the saturation concept: a research note", *Qualitative Research* n°8, 2008, p. 137-152.
- 20- Van der Ploeg (Jan D.), "Styles of farming: an introductory note on concepts and methodology", in van der Ploeg (J. D.) and Long (A.), *Born from within: practice and perspectives of endogenous rural development*, Assen, Van Gorcum, 1994, p. 7-30.
- 21- Heimlich (Ralph E.) and Barnard (Charles H.), "Agricultural Adaption to Urbanization: Farm Types and Agricultural Sustainability in U.S. Metropolitan Areas", in Audirac (I.), *Rural Sustainability Development in America*, New York, Wiley and Sons, 1997, p. 283-303.

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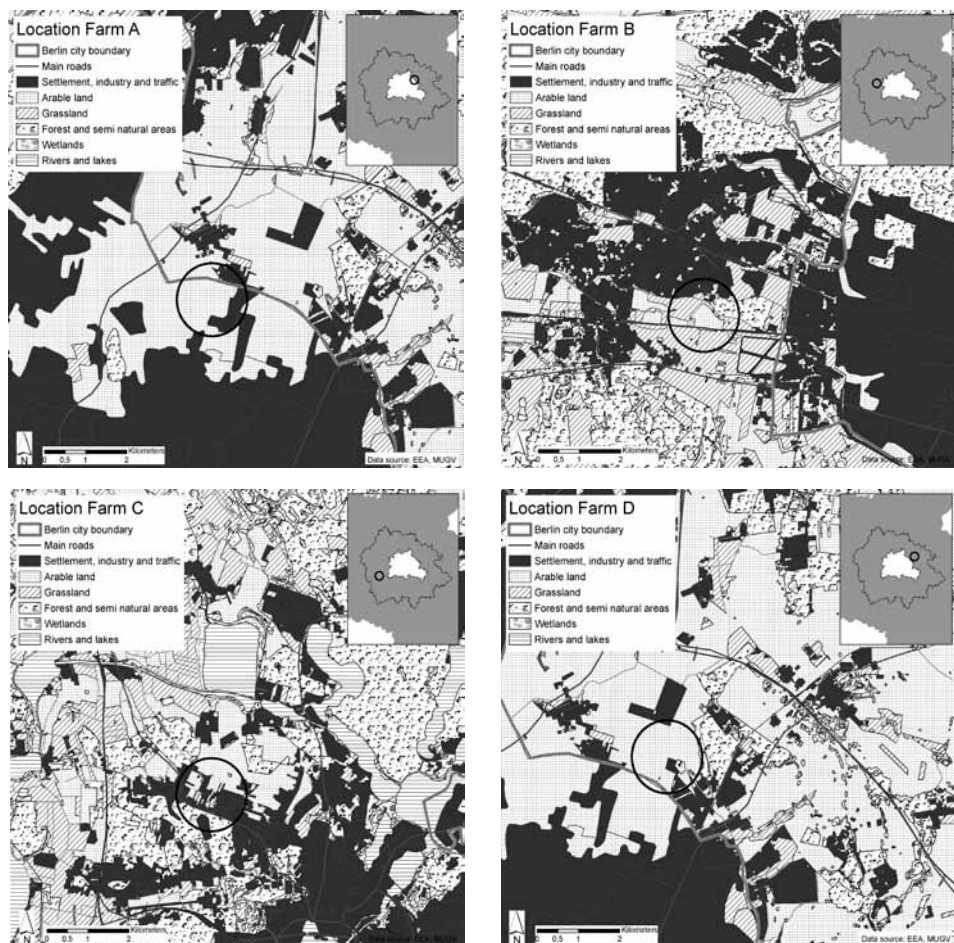


Fig. 3 a-d : Farm Locations.

Traditional Farm (Type A)

“We had to struggle for the first 10 years to remain in this location.” (Farmer A)

The first portrait represents the traditional farm prototype. The conventional salad, herbs and fodder grower is located within the inner fringe of Eastern Berlin, an area of dynamic land use development, urban sprawl and the conversion of allotment gardens for permanent living units. With an agricultural area of about 100 ha (almost exclusively on a tenure basis), it is the most extensive of all the selected farms. It employs seven full-time workers and an additional 30 to 40 seasonal workers.

The peri-urban situation is evaluated differently by the holder. On the one hand, good road access and proximity to the inner city are acknowledged as important factors, even though the farm does not sell products directly to consumers. 60% of the production is delivered to a nearby food processing company. The rest is sold wholesale to fine food businesses in Berlin. In contrast to remote rural areas, the farmer emphasises the opportunities available when providing fresh products on a daily, just-in-time basis. On the other hand, he mentions certain disadvantages, such as mutual conflict with the neighbourhood. In particular, new residents complain about exposure to production and loading-related noise and dust. Farm operations have been disrupted by theft, trespassing, free-running dogs and recreational activities that make intensive use of private agricultural lanes. Higher costs of renting facilities and greater distances to the agricultural area are also noted. Planning security, land scarcity and ownership are not considered an issue. Although rental contracts include termination opportunities in cases of building permission, municipal planning is generally oriented towards farming. However, looking at the overall picture from the farmer's perspective, the disadvantages appear to outweigh the advantages of the peri-urban location. As a typical traditional farm, adaptation strategies to cope with the location within the Metropolitan region are less noticeable. Neither diversification on and off the farm, nor specific urban-oriented production and specialisation are acknowledged. A location change has been considered to escape the difficulties inherent in the peri-urban location, but the farmer felt too established to go ahead with it.

Adaptive Farm (Type B)

“Proximity to the customer is important to get contact and communication.” (Farmer B)

A medium-size holding (ca. 20 ha) located outside a sprawling community North-West of Berlin (distance of 3 km) was chosen to represent adaptive farmers. The hol-

III. Analyse critique de situations et dispositifs agri-métropolitains

ding was established in 1994 with the particular purpose of making use of the consumer potential in the peri-urban location. Most of the agricultural land is rented. Only the farmstead itself is owned. A specialised production of typical regional berries and asparagus are sold uniquely to local consumers through the farm shop. In the wake of recurring food scandals, the farmer recognises a growing interest in regional and natural production. He places great emphasis on communication and consumer trust, although his production techniques are conventional. The peri-urban location is generally favoured by the farm holder and road access and close proximity to urban areas are considered important geographic factors for direct marketing.

Urban proximity is considered less in terms of conflict and more as potential customers. Despite initial expectations by the landowner of additional urban development, at present the producer does not expect any development within the next few decades. He bases his certainty on existing planning regulations which guarantee continuation of agricultural land use. Yet, he abstains from land purchase due to continuing speculation-driven, high land prices. Actively developing the urban market through newsletters, regular farm festivals and attracting new customers, the farm exploits the agricultural opportunities of its peri-urban location. Although no other diversification measures are in place at present, expansion into other activities (e.g. entertainment, gastronomy) is planned. The farm owner cooperates with other, mainly agricultural actors in the fields of pooling with neighbouring farmers and exchange of products to diversify the farm shop offer. Relocation is absolutely out of the question.

Phasing Out Farm (Type C)

“We are not an entertainment park, but a food producer.” (Farmer C)

This portrait gives insights into the third farm prototype – the phasing out model. The organic producer has been in the same location in an outer district of Potsdam, a town close to Berlin, for 50 years. Owning 10 of the 17 ha of agricultural land, the holding has gradually reduced its cultivation area. The overall outlook is insecure, as the farm holder is nearing retirement with no successor in the offing. Still, four full-time employees and two seasonal employees work on the holding.

The peri-urban location is assessed somewhat negatively. While access by car and public transport, and adjacency to the urban consumers are considered as positive factors, from the farmer’s perspective, the direct neighbourhood is seen as relatively conflict-ridden (unauthorised parking, dogs, theft), underpinned by disinterest in agriculture. Moreover, the high cost of municipal services, such as water supply and treatment, as well as street cleaning, are considered as negative factors. Conversion is not expected, as the open landscape has been profoundly valorised and the municipal plans do not in-

tend to exploit land for building purposes. The farm markets its production directly to consumers (70% to organic markets in Berlin, 30% box service, canteen kitchens and own farm shop). Apart from landscape management measures, which contribute only a small amount to income generation, the farm holder is relatively sceptical regarding further diversification measures. Relocation has been considered, but hindered by economic barriers caused by the European Agricultural Policy.

Innovative Farm (Type D)

“The actual production activity is always related to environmental and health education.” (Farmer D)

22- Vandermeulen (Valérie), Verspecht (Ann) and Van Huylenbroeck (Guido), “Perception of Land Scarcity by Peri-Urban Farmers”, in *Proceedings of the 11th Congress of the EAAE The Future of Rural Europe in the Global Agri-Food System*. Copenhagen, August 23-27, 2005, 15 p.

23- Péron (Jean-Yves) and Geoffriau (Emanuel), *op. cit.*

	Farm A (Traditional)	Farm B (Adaptive)	Farm C (Phasing-out)	Farm D (Innovative)
Location	Berlin-Wartenberg	Dallgow-Döberitz	Potsdam-Bornim	Berlin-Falkenberg
Farm area	100 ha rented area	20 ha of rented area (production area)	7 ha rental land	3 ha rented land
Crop Types		0.3 ha self-owned land, (basically farm-stead)	10 ha ownership	
	Salad, herbs, fodder crops	berries, asparagus, sweet corn and pumpkin	fruits, vegetable, fodder crops	Herbs, vegetable, berries, fruits
		1,300 laying hens	30 suckler sheep	
Legal Status	Agricultural enterprise	Agricultural and business enterprise	Agricultural enterprise	Registered Association
Production Mode	Conventional	Conventional	Organic	Organic
Work Force	7 full-time employees	5 full-time and 10 part-time employees	4 full-time employees	30-50 private producers
	30-40 seasonal employees	5-10 seasonal employees	2 seasonal employees	

Table 1: Overview of the selected farm holdings.

III. Analyse critique de situations et dispositifs agri-métropolitains

The last prototype represents farms which have been innovatively adapted to the requirements and demands of nearby Metropolitan areas. An organic garden (“Ökogarten”), which is currently enjoying growing popularity in the area, was selected for the portrait. 30-50 people, organised as a registered association, grow all kinds of herbs, vegetables, berries and fruits. As a non-profit organisation, the main idea behind this type of horticulture is less to do with economics than environment, education, leisure and self-subsistence.

Although they are not yet accepted as agricultural farms, the garden addresses urban dwellers directly. The location on the urban fringe with good access to Berlin’s public transport system is very important as it can be reached easily by the people who work on the farm. The farmers are highly sensitive to the interaction with their urban and agricultural neighbourhood, as they make use of the synergies, i.e. security and farm operation support. They have an extensive network of local actors from politics, nature protection, agriculture and horticulture. While the farm and the social and environmental approach is widely accepted by the neighbouring residents, vandalism and theft is a regular nuisance. However, the concept of the organic garden requires proximity to urban areas, so a move is out of the question.

Discussion and Conclusion

All the cases are located within the peri-urban area and have direct contact with the local housing areas. Mutual conflict with local residents is often acknowledged, but is perceived very differently by the various farm types. Obviously, production intensity has a strong impact on the perceived level of nuisance. Thus, the traditional farm (type A) reports most resident complaints, whereas small-scale, organic producers get along better. More interesting though, holders who interact with the urban neighbourhood in a more open-minded way, such as the adaptive and innovative one, are far less conflict-ridden. They recognise the advantages of proximity to customers and the farm’s integration in the local community. The duration of the farm’s establishment also contributes to acceptance. All holdings are well connected to road infrastructure, which is most appreciated by farms with close social contacts to consumers and user (types B and D). Rather surprising, and in contrast to other findings²², land scarcity, high land prices, land tenure difficulties and planning insecurity are generally not issues for the farmers interviewed. Their trust that they will remain unaffected by urban development is based on the municipality’s comprehensive plan, which in fact only has limited binding force. However, due to low economic and demographic growth in the Berlin Metropolitan region, there has only been moderate suburbanisation pressure in the past. In addition, less space-intensive horticultural holdings are encouraged more than cash crop farmers in order to cope with higher land rents.

Different development trajectories are identified among the farm types. Whereas the

adaptive farm (type B), coming from outside, purposely chose the peri-urban location and focuses production and diversification on the urban market, the phasing-out farm (C) is gradually reducing the agricultural area, seeing farming in the urban fringe as an activity with little promise in the future. However, they all make use of the nearby city, basically selling directly to consumers at the farm shop or in the city's markets. Niche outlets have been developed, like organic production, specific crop types or altruistic combinations for education and health. Yet, the passive types (A & C) have little interest in this potential farm output. In line with observations from other European Metropolitan areas²³, horizontal cooperation with other producers is a frequent, but less strongly pronounced phenomenon among small horticultural holdings to make use of scale economies, and is most prevalent in farm, types B, C and D, but absent with the large producer (type A).

These findings are drawn from an exploration of the horticultural sector in the Berlin Metropolitan region. Based on qualitative information, they are strongly influenced by the researcher's interpretations and need further validation and verification through empirical evidence (e.g. a larger-scale questionnaire survey). However, some conclusions can nonetheless be drawn for the role of the peri-urban location and subsequent adaptation strategies. Horticultural farms assess and respond heterogeneously to the spatial framework conditions. The portraits of prototypical farms contribute to an understanding of the diversity of farming types, their perception of the peri-urban location and decision-making processes regarding adaptation strategies. Negative effects exist, but are outweighed by advantages and opportunities. The adjacent urban area represents a relevant economic factor for the farming activity, its specialisation and diversification as well as for marketing and distribution.

Lebenslauf

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