# FARMING IN THE URBAN SHADOW

Agricultural Innovation and Adaptation Strategies in Peri-Urban Valencia And Copenhagen

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### Abstract

Intensified urbanization in Europe has blurred the boundaries between cities and their peripheries, with the expansion usually done at the expense of peri-urban (PU) agricultural lands. Urban and metropolitan development policies often fail to acknowledge the peculiarity of the peri-urban, precipitating unregulated land conversions to urban uses. These land-use changes often undermine the interests of peri-urban agriculture (PUA) farmers, which initiates a stimulus-response mechanism to innovate and adapt to the change. This study analyzed PU spatial transformations and existing innovation and adaptation strategies to reveal connections between the (peri-)urban space, agriculture, and broader institutional framework in place. Framed within the post-productive paradigm, the study compared the case of *huertas* in Valencia and croplands in Greater Copenhagen. Through GIS mapping and qualitative interviews, the trend of peri-urbanization and the shift to multifunctional PUA in each case were elaborated. Results show that innovations and adaptations in Valencian PUA are highly tied to the territorial protection of the huertas, combined with a relatively new tradition of agroecological transition. Copenhagen PUA shows no significant problems with urban expansion but indicates a thorough preoccupation with extensive green transition and nature conservation. These distinctive PUA trajectories in the postproductive transition can be attributed to their individual spatial planning and governance systems; Valencia has a liberalized planning tradition, while Copenhagen upholds a robust regulative stance. The study implies that comprehensive spatial policy framework and community involvement in city governance are key to building sustainable urban-rural partnerships and metropolitan growth, creating resilient PUA communities and urban food systems.

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# List of Acronyms & Abbreviations

AEF	agro-environmental functions		
CA	civic agriculture		
CEC	Commission of the European Communities		
CEMAT	Council of Europe of Ministers Responsible for Spatial Planning		
CERAI	Centro de Estudios Rurales y de Agricultura Internacional		
CORINE	Coordination of Information on the Environment Land Cover		
CSA	community-supported agriculture		
EC	European Commission		
EESC	European Economic and Social Committee		
EU	European Union		
Eurostat	European Statistical Office		
FP	Finger Plan		
FUA	Functional Urban Area		
GCA	Greater Copenhagen Area		
GDP	Gross Domestic Product		
HUR	Hovedstadens Udviklingsråd		
INE	Instituto Nacional de Estadistica		
IPCC	Intergovernmental Panel for Climate Change		
МА	multifunctional agriculture		
MADRE	Metropolitan Agriculture for Developing and Innovative Sustainable and Responsible		
	Economy		
NGO	non-government organization		
NUTS	Nomenclature of Territorial units for Statistics		
OECD	Organisation for Economic Co-operation and Development		
PEGV	Portal Estadístic de la Generalitat Valenciana		
PP	post-productivism		
PPP	post-productive paradigm		
PU	peri-urban		
PUA	peri-urban agriculture		
RQ	research question		
UN SGD	United Nations Sustainable Development Goals		
UNESCO	United Nations Educational, Scientific, and Cultural Organization		
VMA	Valencia Metropolitan Area		

# **CHAPTER 1**

# Introduction

#### **Research Background**

#### The Peri-urban

The intensified inter-urban competition in the past decades has resulted in the heightened growth of European cities. Driven by this growth, the spatial transformations (business and commercial hubs, infrastructures, housing, industrial construction, suburbanization) tend to go beyond the limits of the city, and thus creating territorial ambiguity – the difficulty to delineate the urban functions within the city limits from its fringes. As urban agglomerations expand and create metropolitan regions, there is no longer a strong dichotomy between the urban and the rural, and thus, the emergence of "new, rescaled formulations of urbanized territorial organization" (Brenner & Schmid, 2014, p. 743).

A manifestation of this new territory is the peri-urban (hereby referred to as PU), a dynamic, transitionary zone between the urbanized area and the rural hinterlands (Zasada, 2012). In contemporary territorial planning, PU has always been a contested concept, not only as a field in academic research, but also as a spatial system itself. To start, the PU has a spatially fragmented character, as urban expansion makes it a pressure point for land use conversion. Combinations of overlapping land uses (e.g. green open spaces, agricultural lands, industrial areas, residential developments) are observed in this zone. The present study sees this fragmented and disputed zone as a rich resource for research, with in-depth exploration of its agricultural activities, territorial politics, and relevance in understanding new trajectories of urban and regional development.

PU presents a strategic location for multiple societal functions. It can provide cities food, maintain green spaces and support biodiversity, and serve as a buffer zone to contain urban expansion. However, as a highly complex spatial system, scholars and policymakers tend to overlook its potential to enrich academic disciplines, such as metropolitan agriculture, food systems, and to strengthen urban-rural partnerships through efficient spatial governance. This study undertakes the challenge of integrating the spatial complexity of PU and the functional fluidity of agriculture it entails.

#### Peri-urban Agriculture as an Urban Agenda

One challenge in PU studies is the lack of consensus in its definition. Another is the inadequate attention given to peri-urban agriculture, henceforth referred to as PUA, as it is overshadowed by industrial-scale and intensive monofunctional agriculture. With the rapid growth of cities, PU agricultural lands are now pressured to succumb to urban-oriented functions. Nowadays, urban expansion through industrial construction, large-scale infrastructures, and leisure services continue to diminish agricultural lands (van Steekelenburg & van Latesteijn, 2012). Likewise, the Intergovernmental Panel for Climate Change (IPCC), considers urban expansion to "lead to conversion of cropland leading to losses in food production" (Special Report, 2019, p. 18). Having this risk to food

security, PUA serves as viable aspect to study sustainable food production near cities, and innovations and adaptation strategies that emerge from this condition.

Agriculture is underdeveloped as an urban research agenda, as it has always been dominated by rural studies. Now that city expansion has become a looming threat to agricultural lands, an urban take on the provincial notions of agriculture must be fostered. With issues on food production and security, urban sprawl, and environmental degradation, PU is becoming evident in academic and public discourse. Interest in PUA from scholars, legislators, and the civil society has been growing in the last few years. This study is then an addition to the burgeoning body of literature on the topic.

PUA, though often neglected and marginalized, has also taken a new trajectory by "introducing post-productive, consumption-oriented adaptation of farming activities" (Zasada, Fertner, Piorr, & Neilsen, 2011, p. 59). Farmers resort to adaptation of a conventional livelihood (Mukherjee, 2006). This trajectorial shift is attributed to the spatial and economic pressure from cities, and thus strategic adaptation and diversification of livelihood in vulnerable farming communities are employed (McGregor, Simon, & Thompson, 2006, p. 324).

PU presents a noble research locus to feature the recent changes in agriculture along with the changing spatial landscape. The general interest in PUA in this study has a dual point of departure: (1) its spatiality and (2) its socioeconomic dimension. On one hand, there has been significant loss of agricultural lands to urban expansion in the past decades; on the other hand, PUA actors employ innovative strategies to adapt to the changing PU landscape. To address these two points, this study specifically looks into (a) the spatial transformations in PU lands, and (b) the changes in PUA in these lands.

#### Statement of the Problem

The main objective of this study is to explore the innovations and adaptation strategies in PUA in a changing PU setting. By doing so, the implications of territorial politics and spatial planning on agricultural PU zones in 2 European metropolitan regions are revealed. The emerging patterns of innovation and adaptation strategies in the farming sector can then be understood, granting the context-specificity of each region. A broader insight on the policies and territorial governance in each region can also be drawn.

In light with this objective, the following general research question (RQ) is presented:

# How are innovation and adaptation strategies employed by different actors in PUA, in relation to the rapidly changing PU landscape due to urban expansion?

Guided by this general question, the study attempts to elaborate the diversified and multifunctional farm adaptation techniques by PU farmers, and the subsequent inclusion of other actors in PUA, as a response to the changing physical and political scene.

The specific RQs are presented as follows:

#### RQ 1. How has PU agricultural land cover transformed over the years?

RQ 2. How do local PU farming actors innovate and adapt to the changing PU landscape, given the rising environmental concerns in agriculture and the evolving (urban) consumer demands?

#### Hypotheses

With European cities rapidly growing, PU areas are now the tension point of two forces: urban expansion and regeneration of PUA. Agricultural actors (e.g. farmers, entrepreneurs, civil society, local authorities) then formulate various strategies to revitalize PUA and secure sustainable food systems amidst territorial transformations.

The PUA innovation and adaptation strategies in this study are construed from the framework of multifunctional agriculture (MA), characterized by diversified production, formation of local movements and collectives (e.g. farmer cooperatives, producer groups, interest organizations), public intervention in policymaking, and integration of environmental values in farming.

This study attempts to answer the RQs with the following hypotheses:

- 1. There has been a significant change in the agricultural land cover in PU zones due to the rapid urban expansion. Often implicated by liberalized planning policies, city expansion on PU lands has resulted in agricultural land abandonment, fragmented landscapes, problematic farm succession, and degraded soil quality, among others. These circumstances give a dual dilemma on PUA lands: (a) how to spatially accommodate the ever-expanding urban areas; and (b) how to invigorate and maintain PUA's relevance in urbanizing societies. Answers lie in innovating and adapting agriculture to spatial changes, and by taking cross-sectoral channels to streamline urban and regional agricultural development goals.
- 2. Innovative and multifunctional adaptative strategies are employed by PUA actors by combining traditional agricultural practices, biodiversity, cultural values, recreation, and social cohesion (Zasada, 2011). The innovation comes from the collective action that arise from the practice of MA (Esposti, 2012). This creates a significant new role of PU as a space where communities could be organized and mobilized, and further support the MA through its civic role (Lyson, 2012).

The innovations and adaptation strategies in PUA can be articulated in terms of:

- a. Multifunctional nature of production
  - i. Diversified farm activities / non-agricultural use of farming structures
  - ii. High-value cropping system
  - iii. Organic farming and horticulture
  - iv. Short food supply chain
- b. Cultural and environmental value of PUA
  - i. Patrimonialization of cultural landscapes
  - ii. Nature conservation in PU

c. Social movement formation and public intervention in policy-making

#### Significance of the Study

The study presents an interdisciplinary approach to urban studies by presenting an interface between the spatial and social dimensions of urban development, agroecology, and civic involvement. Urban influences on agriculture are not only perceived in a spatial dimension, but also as a social phenomenon. By exploring the interconnections between local PU agro-producers and the urban consumers, the formation of social movements, and the ways environment concerns are considered in agricultural production, the innovations and adaptation strategies in PUA are better understood, and thus contribute in the field of social innovation and civic agriculture.

This research also contributes to the urban and regional development field by providing concrete cases of how transitionary zones can bridge the gap between urban and rural development trajectories in Europe. The study can give insights about agriculture as a common concern of both urban and rural policymakers, with implications in the local-, national-, and transnational institutional levels; thus, a possibility to create streamlined urban-rural partnerships.

The study also explores the possibility of providing future urban researchers with valuable resource for European urban development, PU studies, and PUA, by making definitive accounts of urban spatial expansion, specificity of the PU, and qualitative description of agricultural innovations and adaptation strategies in PU zones.

A possible implication of this research to the study of European cities is a historically, geographically, and politically nuanced account of PUA in different regions, by providing substantial insights on how agriculture in its post-productive state is rendered by two European regions – comparing a Mediterranean and a Nordic PU case.

#### Scope and Limitation of the Study

The goal of this study is to determine the extent of urban expansion to PUA lands and to examine the innovation and adaptation strategies of the PUA sector as a response to this. Insofar as the researcher would want to cover all aspects of the study, there are still some limitations that need to be acknowledged.

The PU as the geographical bound of this study has its territorial indicators and scale particular to each case. One commonality in the study areas is the fact that PU falls into the metropolitan region of a city. For uniformity, the study draws on the typology for metropolitan regions based on the European Statistical Office's (Eurostat) Nomenclature of Territorial Units for Statistics (NUTS) level 3. Additionally, the metropolitan imaginary as reflected in the existing planning documents in each case is also considered to enrich analysis.

Agriculture in this study refers to plant-based production (e.g. crops, vegetables, fruit trees) but does not disregard the presence of animal breeding, grazing, or any other agricultural activity, inasmuch as it is contained within the metropolitan region.

Agricultural innovation and adaptation in this study are drawn from the theoretical paradigm of postproductivism. This means that the operative themes adopted here are the innovations from the production side – "farming techniques, organization and marketing" (Cavallo & Spillare, 2018, p. 36). These are then linked to territorial innovation, suggesting spatial planning and governance. Consumption-based innovations are also considered to an extent, but are not intensively probed in this study.

#### Structure of the Study

The succeeding chapters are organized as follows:

- **CHAPTER 2** presents a comprehensive survey of existing academic and institutional literature related to PU and PUA studies. This includes the state-of-the-art of PU studies, agriculture in metropolitan areas, and innovations and adaptation strategies in European agriculture.
- **CHAPTER 3** discusses the theoretical framework in studying the effects of urban growth to PU areas and the ensuing effect in PUA. The chapter also presents the researcher's own conceptual framework that guides the subsequent analytical approach to the study.
- **CHAPTER 4** illustrates the research approach, methodology, data gathering techniques, and analytical framework that guide the study.

- **CHAPTER** 5 introduces the context of the chosen case studies, and further elaborates on their spatial, institutional, and agricultural background to lay the groundwork for analysis.
- **CHAPTER 6** presents the findings of primary data gathering, with the corresponding analyses in relation to the RQs and objectives.
- **CHAPTER 7** synthesizes the findings, presents the implications of these findings to the urban studies field, and suggests recommendations for future directions of the research.

#### **Definition of Terms**

The following definitions are provided for better understanding of terms, concepts, and themes as they are used in the present study.

- Adaptation strategies refer to the various changes in the production techniques, land management, and marketing employed by PUA actors in response to the changes in the PU physical landscape prompted by urban expansion.
- **Agricultural actors** are the population directly concerned with the changes in the agricultural system in the PU, which includes individual farmers, civic collectives, administrative bodies, and local communities.
- **Agricultural innovation** refers to the changes and new moves of actors in the agriculture to achieve advancements and forward-looking changes in technological, social, and political sense, that stems out from MA.
- **Comarca** is an old form of Spanish administrative subdivision that exists between a municipality and a province, usually demarcated by natural barriers. It does not have any executive power or representation in the government of an autonomous community but is nevertheless used a basic collective unit for delivering local public services.
- **Food system** involves all actors, processes, and their interrelationships in the production, distribution, and consumption of commodities coming from agriculture, and their embeddedness in the wider economic, societal, and natural settings (Nguyen, 2018).
- **Metropolitan region** technically refers to the individual or combined NUTS 3 regions having an urban agglomeration of at least 250,000 population (Eurostat, 2014). As a concept, it is an accumulation of economic, sociocultural, and recreational activities of a population in any given regional context, centered in a single or multiple urban center. This serves as the basic geographical bound of the study to explore urban expansion and PUA.
- **Multifunctional agriculture** is a form of agriculture borne out of a general shift from intensive production to a diverse practice that serves different functions in the immediate farming community, consumer market, and the environment.

- **Peri-urban** is a transitionary zone between the urban and the rural, characterized by high land use dynamics and sporadic built-up areas due to urban expansion pressures. In this study, PU is contained within a metropolitan region.
- **Peri-urban agriculture** refers to agricultural production--including horticulture, floriculture, animal husbandry, forestry and fisheries--in both urban and PU settings.
- Peri-urban farmer is the direct and most active actor in PUA preoccupied with crop cultivation.
- **Post-productive paradigm** denotes the main theoretical framework of the study, characterized by a shift from the intensive, specialized, and industrial-scale agricultural production to scaled down and diversified modes of production, environmentally-sound cultivation practices, and involvement of the civil actors in the process.
- **Urban expansion** is the spatial expansion of urban agglomerations beyond a city's administrative limits, driven by economic growth, consolidation of labor market, and population increase.

# CHAPTER 2

# **Review of Related Literature**

This chapter focuses on the literature of academic works related to the present study consisting of three parts. The first part, **Peri-urban: The Space in the Urban Shadow**, presents the research trends in PU as a space. This section provides a survey on different definitions of PU, its dynamic relation to urban and rural functions, and some European planning policies relevant to PU.

The second part, **Peri-urban Agriculture: Farming in the Urban Shadow**, surveys the literature, mostly from Europe, about the fundamental concept of agriculture in PU areas. Also presented are the prevalent definitions of PUA, the challenges and opportunities of farming in the urban shadow, and some policies related to its development.

The third part, **Peri-urban Agricultural Innovation and Adaptation Strategies** explains the precarious spatial conditions of PU farmers and the ensuing formation of innovation and adaptation strategies in response to this precariousness. Prior studies related to post-productivism and MA are reviewed to lay the theoretical groundwork for the innovation and adaptation strategies in PUA.

The chapter concludes with a summary of the state-of-the-art of PU and PUA studies.

#### The Space in the Urban Shadow

#### Points of Departure in PU Studies: Definitions

Theorizing the PU is a highly problematic ground (Friedmann 2011, 2016), as there are varying trajectories of urbanization and expansion of metropolitan regions. Though a consensual and unified method to spatially delimit the PU is non-existent (Morán Alonso, Obeso Muñiz, Hernández Aja, & Fernández García, 2017; Narain & Nischal, 2007; Allen, 2003), this section attempts to create a simplified definition by elaborating on several points of departure in PU studies.

The existing academic literature in PU studies can be gathered into 3 approaches – as a place, a process, and a concept (Narain & Nischal, 2007).

#### As a place

PU is a transitional zone between the urban and the rural where social and political forces come together and form a "restless landscape" (Friedmann, 2016 p. 2). Because of its high land use dynamics, low population, sporadic developments and fragmented communities, and weak spatial governance, it is considered "a zone of chaotic urbanization" (Ravetz, Fertner, & Nielsen et al. 2013, p. 13).

There are various studies that attempted to spatially delineate the PU. Stevenson et al. (1996, in Mougeot, 2000) measures PU according to the force of urban influence in a given system. Losada et al. (1998) used infrastructural densities (building and road ration to open space per square kilometer) to identify urban, PU, and suburban zones.

In relation to PU agricultural lands, distances matter more than any other indicator, as it is connected to the efficiency to supply fresh food to cities. Lourenço-Lindell (1995) focused on the distance covered by traveling from a city's administrative boundary to farmlands. Some other indicators include the percentage of farmers who manage to immediately sell their produce at farm gates (Stevenson et al., 1996 in Mougeot, 2000), and the time it takes to reach point A to B, or the maximum distance that a perishable good from a farm can reach the city (Moustier, 1998).

A holistic definition was provided by the Council of Europe of Ministers Responsible for Spatial Planning (CEMAT), describing PU as:

"areas in some form of transition from strictly rural to urban ... on the fringe of established urban areas, but some are clusters of residential development within rural landscapes. Periurban areas are most frequently a result of suburbanisation or urban sprawl." (2010, p. 295)

#### As a concept

Theorizing the PU as a geographical entity is easy but analyzing its socio-spatial processes are context-specific. Historical and political precursors contribute to the complexity of its spatial structure make it difficult to fit in the conventional urban-rural models (Ravetz et al., 2013). It overlaps with other approaches, like urban fringe (Bryant, 1984), urban-rural interface (Briquel and Collicard, 2005), semi-urban (Meeus & Gulinck, 2008), and periurban fringe (Simon, 2008). Whichever way one defines it, PU is a testament of an outmoded dichotomy between the urban and the rural, and thus the emergence of "new, rescaled formulations of urbanized territorial organization" (Brenner & Schmid, 2014 p. 743).

As a concept, PU is product of interaction of different systems: the urban, agricultural, and environmental systems (Allen, 2003), a manifestation of the presence of urban functions in a rural landscape (Morán Alonso et al., 2017). Apart from being widely defined a result of integration of urban functions and activities into rural areas, it is also a "complex adaptive system" (Rauws & de Roo, 2011, p. 2) subject to external forces, relationships, and structures that co-evolve over time (Portugali, 2006; Wolfram, 2002).

#### As a process

PU is also a process, when viewed from the structural side of city expansion and rural development. It is a compromised area resulting from "a lack of planning and coordination, municipal competition, NIMBYism ("Not In My Back Yard") and conflict of objectives" (Piorr, Zasada, Doernberg, Zoll, & Ramme, 2018, p. 14).

#### Urbanization Beyond City Limits

Nowadays, intensified urbanization in Europe is a major phenomenon that according to European Environment Agency (EEA), 72% of the European population is living in urban areas (2017). This high number of urban

populations can be ascribed to the formation of functional urban areas (FUAs) metropolitan regions, wherein the population in the peripheral area is integrated into the city's urban network. As it is expected to absorb the spillovers of urban growth (Kontgis et al. 2014), PU becomes a setting for the urban expansion-induced socio-spatial transformations.

PU has been a challenge for European policymakers, especially in the last 2 decades. Despite a high number of urban populations, urbanization patterns show uneven distribution of economic agglomerations (Ravetz et al., 2013). Western European countries get most of the share while the other regions, such as the southern and central eastern European countries, have difficulty gaining on. This unevenness translates to local-level problems of urbanization, such as conversion of prime farmlands to urban uses, fragmented landscapes, dispersed infrastructure developments, traffic congestion, unsustainable urban lifestyles, and socio-spatial segregation (Nilsson, 2010).

#### European Policy Framework for Peri-Urban Development

With peri-urbanization becoming a common spatial issue in Europe in the recent decades (Zasada et al. 2011, p. 59), the European Union (EU) is now moving towards having an integrated approach for balanced regional development. through policies, research funding, and cross-sectoral collaboration at local, regional, national, and transnational levels. Different research programs and policy tools have been launched to respond to the growing PU problem. Starting from the European Spatial Development Perspective (ESDP 1999) to the recent EU Cohesion Policy (2014-2020), a holistic policy approach has been undertaken to achieve cohesive city-regional development and urban-rural interconnectivity in economy, culture, built infrastructure, environment, and agriculture.

The ESDP (Committee on Spatial Development, 1999) was the first framework to outline intergovernmental cooperation in spatial development, however not legally binding. The policy framework calls for strategic spatial development and multi-sectoral involvement in creating polycentric urban systems to boost urban-rural partnerships, while integrating economy, environment, and mobility the plans.

The Territorial Agenda of the EU (TAEU) 2020 reiterates the responsibility of EU member states to implement cohesive spatial planning policies, and supplements the United Nations Sustainable Development Goal (UN SGD) # 11 – "Make cities and human settlements inclusive, safe, resilient and sustainable" (United Nations, 2015), as well as the EU Urban Agenda.

The PLUREL Project is part of the European Commission's 6<sup>th</sup> Framework Programme whose research focus is on the PU areas and their developmental facets (e.g. economy/employment, population/migration, housing/community, mobility/transport, food/farming, environment/landscape, recreation/tourism), and formulation of policy recommendations for territorial cohesion.

Regionally-focused research initiatives were also launched, such as the Metropolitan Agriculture for Developing and Innovative Sustainable and Responsible Economy (MADRE), a multi-sectoral research collective specializing in Mediterranean urban regions. Although there have been attempts to manage peri-urbanization and harmonize urban-rural partnerships through agriculture, their effectivity has not materialized yet, especially in the local level. These policies are not tailored for the specific needs of the farms in the PU zones (Piorr at al., 2018).

The research and policy implications of the PU dynamism is still a growing academic agenda. The present study thus treats this predicament as the main driver for a deeper exploration of grassroots movements and citizen initiatives for a more resilient PUA. This means looking into the mechanisms of mobilizations, and the windows of opportunities for innovations and chance for inclusive participation of local stakeholders (e.g. farmers, agro-producers, farmer collectives) through involvement in policymaking.

#### Farming in the Urban Shadow

#### What & where is it?

PUA is defined in different terms, same as PU and agriculture, but its general orientation revolves around production in irrigated farmlands. PUA is a highly arbitrary concept that it is tied to its historical and cultural context and relative relevance in place and time (Mougeot, 2000).

The overarching definition of PUA covers academic, political, and economic discourses in sustainable urban development, food systems, urban-rural partnerships, technology, climate change, and social innovation. Moreover, PUA can be in terms of cultivation practices, character of the PU location of production (the great PU debate), scale of production and distribution, and food supply chain.

PUA is a place of production of food and non-food commodities. PUA's *in-between* stance makes it a "residual form of agriculture at the fringes of growing cities" (Opitz, Berges, Piorr, & Krikser, 2016, p. 342), because its inadequate coverage of arable lands defeats its potential for intensive agriculture.

The location of PUA is also highly debated, because there is no standard definition of PU to start with. However, there are some studies that offer substantial characterization of PUA linked to its multifunctional character. Swindell (1988) posits that PU is "...where the advantages of combining farm and non-farm work can be maximized" (p. 98, quoted by Binns & Lynch, 1998). For the European Economic and Social Committee (EESC), PUA is where "professional farming co-exists with other activities linked to the growing of plants for recreational, therapeutic, educational and other reasons or for the purpose of creating and maintaining landscapes" (2004, p. 3).

Other studies delineate PUA from rural agricultural production in terms of the scale. PUA is usually a small-scale production, as it is normally done for self-consumption or targeted towards small market communities (Howe, 2002; Besthorn, 2013). Operating at small scales, recent studies also show that PUA is typically managed by individual, families, or SME agro-producers (Smith, Greene, & Silbernagel, 2013; Kortright & Wakefield, 2011), in contrast with industrial-scale crop and farm suppliers in rural areas with bigger lands to utilize.

Research in agroecology and nature-based solutions to farming also show that organic-based production in PUA usually has a short food supply chain (Kalfagianni & Skordili, 2019; (Grando, Carey, Hegger, Jahrl, & Ortolani, 2017).

This means direct selling, with the absence of middlemen and contractors, is done to valorize value-added cultivation and maintain high-value cropping system.

Mougeot thus comes up with a broad definition of peri-urban agriculture:

"...located within (intra-urban) or on the fringe (peri-urban) of a town, a city or a metropolis, and grows or raises, processes and distributes a diversity of food and non-food products, (re-)uses largely human and material resources, products and services found in and around that urban area, and in turn supplies human and material resources, products and services largely to that urban area" (2000, p. 10)

Simply put, PUA is food production in the boundaries or outskirts of urban areas.

PUA gained traction in public and academic debates along with the advent of discourses in sustainable urban development, urban food supply systems, food sovereignty and security, and climate change. The strategic location of PUA relates to resilient food system and security. In the study of metropolitan agriculture by Cavallo & Spillare (2018), the cultivated lands within metropolitan areas are an important component in sustainable future of cities, where social innovation and territorial development can be achieved. Thus, PUA is an innovative space in agriculture (Bryant 1984).

One more salient issue about PUA is its connection to urban development and urban-rural linkages. Over the years, the growth of cities has transformed PU lands through industry and infrastructure building. Even EESC expressed that urban expansion is "... gobbling up prime farming land and generating an increasing number of marginal and uncompetitive agricultural areas" (2004, p. 1). The PU being a transitionary zone between the city and the countryside positions PUA in an even more disadvantaged position.

In Spanish Mediterranean cities, rapid urbanization and urban sprawl are more pronounced in the metropolitan regions and coastlines (Paül & Tonts, 2005) which affects clearly affects PUA activities. In the Danish context, land-use changes in the PU are driven by increased migration to the urban fringe. This movement transforms PUA through multifunctional adaptation strategies targeted to urban population (Fertner, 2012).

Farming in the urban shadow, thus, is a concept that comes with many complications – both in spatial and economic terms. PUA is highly susceptible to transformations and external pressures, as seen in the apparent fragmentation, land speculation, and urban consumption. This study attempts to show that PUA's proximity to urban areas also present an opportunity to innovate and revitalize itself to adapt to the pressures through multifunctional means.

#### Who is it?

Like conventional agriculture, PUA also has a diverse range of actors from cultivation to consumption. D'Alessandro et al., (2018) describes this diversity as an aggregation of activities of various actors with varied goals, and thus producing differentiated output and opportunities for communities. These actors are the suppliers of farm resources [capital manufacturers], farmers [producers], distributors and transporters [logistics], merchandisers and retailers [market chains, shops], consumers [the public], and managers [NGOs, farmer collectives, government agencies] (Mougeot, 2000). They are multi-sectoral actors with diverse relationships; they can be "complementary and synergetic, competitive and antagonistic, collaborative or adversarial, equitable or exploitative" (ibid., p. 14).

This study focuses on the mechanisms employed by the farmers in their activities, consequently getting transferred to retailers and consumers. The broader managerial role of the policymakers (in spatial planning and agriculture) are also explored, as it gives an extensive background for the innovation and adaptation strategies of the famers.

Farming in the urban shadow is thus a multi-sectoral process, and different relationships form from various interactions. It is in these interactions that innovations and adaptations emerge.

#### How is it?

Current cultivation practices in PUA show a shift from the traditionally intensive food production, to multifunctional farming strategies and techniques. PUA has not yet reached a fully productive, commercial-scale farming (Piorr et al., 2018), but it has been successful in diversifying whose outcomes can be an advantageous over time.

Studies on PUA practices in Europe have been carried out by Stacchini (2018) in Bologna, Italy; Duvernoy et al. (2018) in Toulouse, France; and Romero & Melo (2015) in Valencia, Spain. These studies primarily focus on the political drivers of agricultural landscape change, efforts in sustainable innovation systems, good practices in agriculture, and creation of resilient metropolis through PUA. Multifunctionality in these studies means going beyond farming practices, and integrating of biodiversity conservation, cultural heritage preservation, and community empowerment in practicing PUA.

Environmental awareness is also a key characteristic of multifunctional PUA. Agricultural policies started promoting ecologically-friendly and cruelty-free modes of agricultural production, while tapping on the issues of landscape management, nature protection, and community development (van Steekelenburg & van Latesteijn, 2012). Studies on the conservation of green spaces in the urban outskirts and containment of urban growth are also done, such as in the case of Greater Copenhagen (Caspersen, Konijnendijk, & Olafsson, 2006).

Indeed, PU areas are vital in many environmental aspects (e.g. climate change mitigation, air purification, and flood control in cities), but even more so in sustaining food supply, sovereignty, and security in metropolitan regions (Melo, 2018). Research in multifunctional PUA in relation to resilient food systems have been done in north-western and central Europe (Olsson et al., 2016; Zasada et al., 2011; van den Berg and van Veenhuizen, 2005) and in the Mediterranean region (Cavallo & Spillare, 2018; Marques-Perez et al., 2014), and also in relation to added ethical values vegetable production (Péron & Geoffriau, 2007). PUA thus offers an avenue to develop urban resilience and reduce dependence on global food systems. By enhancing its potential through government

support and consideration in spatial planning, agriculture will then be reintegrated to regional food production (Olsson et al., 2016).

PUA also provides cultural values and identity to people. It can provide historical and cultural values, such as the heritage landscapes of the Spanish *huertas* in Valencia and Murcia (Romero & Melo, 2018). Assessment of the cultural services and identity creation offered by PUA was also done (Simon Rojo, Moratalla, Alonso, & Jimenez, 2014), seeing that the relevance of values to the current farming practices are often discounted at the local level of urban planning.

#### Land & Agro-Urban Policy Implications

This study revolves around the theme of transformation, seen in 3 ways: changes in PU lands (spatial), changes in agricultural practices in the PU (socio-economic), and changes in planning and agricultural policies (structural).

Policies in spatial planning and agriculture is key in making PUA realize its potentials in food security, sustainable development, and efficient urban-rural linkages. The in-between status of the PU makes it the perfect interface to streamline both from spatial planning strategies and agro-environmental policies (Fanfani, 2013).

Studies about the interconnection of the three have been done, focusing on strengthening urban-rural partnership to improve resilience in food systems and climate change, and to empower local PU communities through spatial planning policies (Olsson et al., 2016; Dubbeling, 2014). Kristensen (2001) argues that relevant and context-specific policies for sustainable agricultural development can be achieved by focusing on the local-scale agricultural adaptation strategies and creative innovations tied to local spatial analysis. This will inform policymakers of the economic and environmental benefits of agricultural adaptations.

Friedberg (2001) and Simon et al. (2003) especially focus on the lack of land regulation, tenure rights contestations, and loss of agricultural lands to housing and infrastructure in PU areas. The challenge now for the authorities is to mediate conflicting interests, alleviate urban pressures, and allow local participatory structures to play out in the PU– often which are not met satisfactorily.

In the case of EU, the Common Agricultural Policy (CAP) since the 1970s allowed farmers to be subsidized to encourage them to invest in new innovative technologies and enhance their expertise in the field. The policy's main provisions include direct payments to farmers, market control in case of crisis, attention to rural development to secure cooperation, innovation, and training provisions for young farmers, and regulations in terms of transparency, monitoring and evaluation, etc. CAP considers PUA as a primary agricultural sector with official status like the big farmlands in the rural areas. Although it shares common traits with rural agriculture, it has its own issues with territoriality and arbitrariness of production. As Piorr (2018) noted, the policy disregards the particularities of PUA in terms of actors, scale, proximity in urban zones, and diversity of practices.

#### Peri-urban Agricultural Innovation & Adaptation Strategies

PUA areas are a special space, in that they are "simultaneously sustained and imperiled by the dynamics of the urban economy" (Friedberg, 2001, p. 353), a seemingly paradoxical condition. The highly complicated and context-

specific relationship of the city and to its periphery makes room for opportunities, creativity, and innovations (Foot, 2000). For Marshall et al., it is "through the exclusion of services, of regulation... that opportunities are created" (2009, p. 5).

The concept of innovation in this study refers to "the process of creating something new, coming up for better solutions for existing (societal or market) needs or meeting new, still unspecified requirements" (van der Schans, Renting, & van Veehuizen, 2014, p. 3). For PUA, innovation can be examined as a confined land space, as organization of production, and as community participation (ibid.). The present study draws on these dimensions to explore agricultural innovations in PU farmlands.

The concept of adaption strategies in this study is based on the post-productive framework, where adaptation strategies are regarded as a coping mechanism of both individual farmers and local farming communities in the wake of shifting agricultural systems, and changing PUA lands, in order to improve farmer's livelihood condition (Zasada et al., 2011).

Building up on these views, the study explores the opportunities for innovation and adaptation strategies that flourish in PUA lands despite urban pressures. In this regard, the adaptation strategies and innovations in PUA can be recapitulated as multifunctional. Some examples of different adaptation strategies and innovative initiatives include diversification (pluriactivity), recreational and environmental farming, landscape management, direct marketing, prevalence of agro-environmental policies, and community involvement in policymaking. Additionally, PU in Western Europe and North America includes part-time farming, pick-your-own operations, and farm tourism (Bryant et al. 1982; Fleury & Donadieu, 1997 in Beauchesne & Bryant, 1999).

These innovation and adaptation strategies are not mutually exclusive and can complement each other.

#### Diversification & Pluriactivity

Farmers come up with ways to generate income from their lands outside agricultural activities to revitalize onfarm activities. Examples are farm-based tourism, such as the corn labyrinths (Lohrberg, 2001) and horse-keeping on farms in Berlin (Zasada, Berges, Hilgendorf, & Piorr, 2013). Sustainable tourism also plays a part in pluriactivity in PUA, such as accommodation services for travelers and tourists (Cerutti et al., 2016), especially when the PU area contains natural amenities such lakes, forests, and mountains.

Additionally, high-value cropping system and specialized products are also ways to diversity income in PUA, due to the proximity of urban consumers and their increasing interest in regional branding of agricultural products. Extensification in PUA is also evident, concentrating on lifestyle or recreational farming (Zasada, 2012), also termed hobby farming/horticulture/part-time farming.

#### Agroecological Farming & Agro-Environmental Policies

In line with the sustainable development goals and the increasing need for climate change adaptation, environmental policies have been integrated to agriculture. Structural policies are needed for PUA to have significant impact in the society. In this light, nature considerations in agricultural policies are considered an adaptation strategy, and as a multifunctional trait of PUA.

Agroecological (i.e. organic) farming is a product of these agro-environmental policies. Agroecological functions of agriculture are often tied to the physical landscape of the area, with studies like the analysis of agro-environmental functions (AEF) in farming activities found in the Mediterranean region, where spatial variability allows for a higher instance of AEF (Marraccini, 2010).

#### Direct Marketing & Short Supply Chains

Renting, Marsden, & Banks (2003) argue that short supply chains and direct interaction of actors involved in alternative food networks in Europe plays a significant role in the rural development and diversification process of the farms. Examples of direct marketing include farmer's markets, farm gate purchases usually along the motorways, and pick-your-own approach in buying produce. (Beauchesne & Bryant, 1999).

#### Cultural Heritage & Landscape Preservation

PUA is valued as an integral part of cultural landscape for some PU areas, such as in the centuries-old Mediterranean *huertas*. To preserve these landscapes, land patrimonialization is currently advocated by the social movements. PUA is thus no longer solely regarded as a plain field of production, but also as a cultural symbol and a platform for community development.

#### Community Involvement & Civic Agriculture

PU as a cultural-historical heritage can also foster citizen movements and local community involvement in policymaking, such as in the *huerta* communities in Valencia, Spain (Melo 2018). In the context of urban expansion compromising PUA lands, a stimulus-response mechanism of PUA actors generate innovative ways and adaptive strategies to challenges. Similarly, this study inquires on the innovations of PUA actors in response to urban planning policies.

PUA also serves as a platform to recouple the farming sector to the rest of the urban society through communitysupported agriculture (CSA), civic agriculture, alternative food networks, farmer collectives, and grassroots movements. Civic agriculture (CA) is considered an innovative way in food production because it offers an alternative and sustainable way to practice agriculture, contrary to industrial-scale intensive agriculture (Lyson, 2004).

A study shows that farmer who are collectivized exhibit a rather high awareness of environmental impact of agriculture (Oberholtzer, 2004), while reflexive resilience is observed as an adaptive awareness mechanism of CSA when market shocks occur (Moore, McCarthy, Byrne, & Ward, 2014).

#### Summary

The literature review reveals that agriculture in PU has different facets of articulation – as a place, concept, and process. This means that PUA can also be construed from different perspectives, which then only adds to its multifunctional value. Coming together, PU and PUA resonate a paradigm shift in agriculture, which produces a dynamic platform for innovation and adaptation strategies.

### CHAPTER 3

# **Theoretical & Conceptual Framework**

This chapter presents the theoretical and conceptual framework employed in the study. Based on the articulations in the literature review, suitable theory and concepts for presenting and interpreting the innovation and adaptation strategies in PUA are discussed in this chapter.

#### Theoretical Framework: The Post-Productive Paradigm

The theoretical assumptions in the study are grounded in the post productive paradigm (PPP), in lieu of changing PU farmlands lands due to urban expansion. The PPP serves as basis for analyzing the relevance and interconnectedness of the adaptation strategies and innovations in the agricultural landscape transformation in the chosen case study areas.

#### Productivism vs. Post-Productivism

Post-productivism (PP) is "a new era of agricultural production" (Woods, 2011, p. 79) that emerged in the 1980s and gained traction in the 1990s, just when agriculture discourse was thought to have a static character. The paradigm shift was driven mainly by new policy goals in the decade at a pan-European scale, as a reaction to over-production, declining food quality, environmental degradation, and animal welfare issues (Almstedt, 2013).

Productivism entails an industrial farming model that maximizes farm output by technology for better yield (Jack, 2007). State subsidies in agro-chemicals, genetically-modified crops, and heavy farm machineries entail this system. Post-productivism, on the other hand, is rooted in environmental awareness, small-scale production, and non-agricultural use of farming lands for income diversification (ibid.). From a policy perspective, post-productivism can be viewed as a consequence of decreased state support in agriculture, decline in the gross production output, state integration to globalized market competition, and focus on environmental conservation (Ilbery & Bowler, 1998). Thus, PP is a reaction to the productivist approach, highlighting diversification, organic farming, landscape protection, and involvement of the public in agricultural discourse.

Despite the seemingly dichotomic stance of productive and PP paradigms, some scholars argue that the two are neither mutually exclusive phenomena, nor a linear change over time (Wilson, 2000; Ray 2000). Instead, both exist simultaneously, in varying degrees, depending on the social, political, geographic context surrounding an agricultural society.

#### Multidimensionality of Post-Productivism

The PP state of an agricultural system is not solely tied down to agricultural practices alone; rather, it is a combination of multiple dimensions. Various scholars have attempted to articulate these, including Wilson (2000), Evans et al. (2002), and Markey, Halseth, and Manson (2008).

Wilson (2000) has an extensive approach, suggesting 7 inter-related dimensions to describe the characteristics of post-productivism, not as a direct counterpart of productivism, but its mirror image:

- ideology
- actors
- food regimes
- agricultural production
- agricultural policies
- farming techniques
- environmental impacts

Evans et al. (2002) presents multiple characterizations of PP summarized into 5 categories (adapted from Almsted (2013):

- shift from quantity to quality in food production
- growth of on-farm diversification and off-farm employment (pluriactivity)
- promotion of sustainable farming through agro-environmental policy
- dispersion of production patterns and environmental regulation
- restructuring of government support for agriculture

For Markey, Halseth, and Manson (2008), PP has 3 main categories to be analyzed:

- nature of production, characterized by the shift from commodity to non-commodity produce
- consideration of landscape and natural resources
- the land-use governance

Building up on these articulations, the present study formulates a conceptual framework that includes the physical land and the economic activities tied to it, food systems, environmental protection, PUA actors, and system of governance, from which the analytical framework can be drawn.

#### Spatial Particularity of Post-Productivism

PP presents a transitionary agricultural phenomenon that is highly territorialized, such that "different localities are positioned at different points in a temporal, spatial and conceptual transition" (Wilson 2000, p. 77). This differentiation is not only between countries but also regions and farms (Ilbery & Bowler, 1998; Marsden, 1998). For example, the European Mediterranean region is not a completely productivist region, while the northern European countries seem to have already been integrated into the transition (Wilson, 2011). This means that PP, in its broadest sense, takes on certain function and character in each farming locality, in a specific period.

As the theoretical framework of this study, PP is used to understand the changes in agricultural systems in the spatial context of the PU – thus representing a transitionary phenomenon in a transitionary zone. In this way, the particularities and arbitrariness of the PU, having opposing forces of urban and rural land-use, are examined.

#### The Post-Productive Shift: Multifunctional Agricultural Regime

The PP shift means inclusion of new roles of agriculture to diversify the rural economy. PP is an evidence that agriculture must be transformed in order to remain relevant in highly urbanizing modern societies, and therefore it can no longer remain a mere economic activity (Allaert et al., 2006). This gave rise to the main theorization of PP as multifunctional, integrating environmental and social considerations in food production (Morán Alonso et al., 2017), while remaining deeply embedded in the farming localities and regulatory authorities (Wilson, 2000). The multifunctionality of PUA is also related to urban forces, such as the city-dwellers' demands for environmental quality, enjoyment of cultural landscapes, leisure and recreation, and regional food (Zasada, 2011).

The essence of the PP transition in agriculture lies in its multifunctionality, and how specific farming communities utilize agriculture in various dimensions, given their particularities in territory, politics, and society.

#### **Conceptual Framework**

The conceptual framework of the present study is formulated by synthesizing the articulations of PP as multidimensional, territorial, and multifunctional. Additionally, Bryant's (1984) framework for understanding agricultural landscape changes, is also considered. In this way, the agricultural innovation and adaptation strategies in PU farmlands in different localities can be analyzed.



Figure 1. Conceptual framework of the present study for each case

A schematic model (Figure 1) is formulated to provide an overview of the conceptual foundations applied in this study, in order to transform the relevant concepts into concrete, workable representations. The scheme shows that PUA is exposed to urbanization, non-urbanization, and regional environment forces. Agricultural land loss and deterioration of farming practices in the PU areas come as consequences of these forces. PUA then employs innovation and adaptation strategies to cope with the changes. Resulting from these coping mechanisms is a MA that entails a new nature of production, community involvement, and environmental and landscape values.

# CHAPTER 4

# Methodology

This chapter presents the research design espoused in this study, along with the data collection methods and analytical framework used to answer the RQs.

#### **Research Questions**

This study seeks to examine the kinds of adaptation strategies and innovations that emerge in PUA areas, as farmers cope with substantial loss of cultivated lands due to urban expansion. It is therefore important to reiterate the RQs that guide the present study:

- RQ 1. How has PU agricultural land cover transformed over the years?
- RQ 2. How do local PU farming actors innovate and adapt to the changing PU landscape, given the rising environmental concerns in agriculture and the evolving (urban) consumer demands?

#### **Research Approach**

A comparative case study approach was employed in this work to assess the theoretical generalizations of PPP. Given that PPP is a context-specific phenomenon, the comparison was drawn from 2 different European regions – the Mediterranean and the Nordic.

As a case study, this research creates an exhaustive account of a spatially- and temporally-specific subject matter; and being comparative, this study presents and analyzes the similarities and differences of elements in multiple cases. By combining the two approaches, ambiguous assumptions in one case study can be clarified, delineated, or even negated by another. This comparative case study explains how context-specificity reveals common element/s between two cases that could come in different manifestations; thus, unveiling the inherent nature of the chosen cases.

Comparative case studies are important to topics about human-environment interactions and relationships (Knight, 2001, p. 7040). In this study, the relationship between the physical agricultural lands (i.e. environment factor) and the agricultural innovation and adaptation strategies (i.e. human factor) were examined and intended to explicate the generalizations of PPP. By using a comparative case study approach, the significance of PPP as the theoretical framework to support the relationship between the PU land transformations and the emergence of innovation and adaptation strategies in PUA is given more depth and validity, as it spans across 2 different regional cases in Europe with their own particularities.

#### **Research Design**

As a comparative case study, this research utilizes qualitative methods to answer the RQs. RQ 1 refers to the spatial transformations of PUA lands and entails data visualization method to qualify the extent of land cover

change due to urban expansion. RQ 2 refers to the descriptive accounts of innovation and adaptation strategies of the PUA actors in these agricultural lands.

The adaptation strategies and innovations were collected simultaneously with the PU spatial change data. Both data sets were examined separately and then combined and compared, in order to cross-validate and justify generalizations. The general research design of this study is shown below (Figure 2).



Figure 2. Research design of the present study

#### Scoping and Delimitations

#### Delimiting the Peri-urban Space in the Case Studies

Determining the geographical scope of this comparative case study was the first step in analyzing the PU space. To demarcate the PU area in each case study, it was important to consult standardized documents and official agencies that can provide widely accepted land classifications and territorial delineations. In this light, official European agencies such as the Eurostat and the European Spatial Planning Observation Network (ESPON), national statistical agencies, and city-region planning authorities were consulted, as they provide varied levels of coverage and capacities.

The metropolitan areas of two European cities were delineated to study the PU space, as this territory presents a rich landscape of transition from the urban to non-urban lands. The regional area of Valencia, Spain was based on the NUTS 3 level, code ES523 as shown in Figure 3.



Figure 3. Valencia Metropolitan Area delineation in the study

For the Greater Copenhagen Area, Denmark, a combination of 2 NUTS3 regions, the DK012 and DK013 were delineated (Figure 4).



Figure 4. Greater Copenhagen Area delineation in the study

The spatial delimitations of the metropolitan areas were used to curb the scope of landscape transformations being analyzed, and to corroborate the findings with the subsequent qualitative data. However, it is important to note that triangulating the spatial transformations only gives an insight about the PUA innovations and adaptations that may occur in the area, but do not necessarily imply an inherent relationship between the two.

The data gathering was done from May to August 2019.

#### Sampling and Population

The sampling technique employed in this study was purposive sampling. It was deemed appropriate and necessary by the researcher to involve participants who were able to provide in-depth and first-hand information about the current agricultural practices, adaptation strategies, food supply chain, spatial planning systems, and political underpinnings of spatial transformations in the PUA lands.

The population that participated in the study were organizations and individuals who come from the farming sector, non-government and interest organizations, socio-civic movements, food communities, and planning institutions.

The following tables present the list of interviews conducted, for Valencia (Table 1) and Copenhagen case study (Table 2) respectively.

Name	Role / Title	Organization	Organization Type	
J. G.	Active member	Per l'Horta Movement	Social movement	Personal
R. S.	Farmer	L'Aixada com Eixida -	Organic Farmer	Personal
		SPG-Ecollaures	Collective	
P. L.	Sociologist	Centro de Estudios	Non-government	Personal
		Rurales y de Agricultura	international	
		Internacional (CERAI)	organization	
Mr. Brown	confidential	Generalitat Valenciana	Regional government	Personal

Table 1. Interview list for Valencia case study

#### Table 2. Interview list for the Copenhagen case study

Name	Role / Title	Organization	Organization Type	Interview Type
J. J.	Chief Consultant,	Erhvervsstyrelsen -	Government	Phone
	Physical Planning	Danish Business	agency	
	and Urban	Authority,		
	Development	Danish Ministry of		
		Business and Growth		
С. В.	Legal Advisor;	Landbrugsstyrelsen -	Government	Email
	Officer, EU Direct	Danish Agricultural	agency	
	Payments	Agency,		
J. O.	GIS specialist/	Danish Ministry of		Personal
	surveyor	Environment and		
J. V.	Officer,	Food		Personal
	Environment &			
	Biodiversity			

L. T.	Farmer	Hovholm Farm, Smørum, DK	Farm	Personal
Р. К.	Chairman	<i>Økologisk Landsforening -</i> Organic Denmark	Interest organization	Phone
J. B.	Representative	<i>Københavns</i> <i>Fødevarefællesskab</i> (KBHFF) - Copenhagen Food Community	Organic food cooperative	Personal
О. К.	Production Manager	Beyond Coffee	Business start-up	Phone

#### Data Collection Procedure

To answer the RQs about the transformation of PU lands (RQ1) and the existing innovation and adaptation strategies in these lands (RQ2) qualitative methods were used. The data gathering was done between April and August 2019.

#### Gathering Geospatial Data from CORINE Land Cover

To identify the extent of transformation of PU lands due to urban expansion, the pan-European land cover geospatial data from a public cartographic portal, the Coordination of Information on the Environment Land Cover (CORINE Land Cover) were accessed for both cases. Focusing on the metropolitan areas of Valencia, Spain and Copenhagen, Denmark, the downloaded geospatial data were processed through QGIS desktop application.

The open-source geodata portal of CORINE provided time-series datasets for 1990, 2000, 2006, 2012, and 2018. Data from 1990 and 2018 were specifically chosen to visualize and compare the significant land cover changes in an almost three-decade timespan.

#### Semi-structured Interviews

Semi-structured interviews with different actors, such as farmers, urban planners, policy consultants, etc. (refer to Table 1 and Table 2) were carried out to collect information on current state of PU lands, spatial planning system, policy innovations, PUA, and crop cultivation and production practices.

The interviews were conducted in person, through phone, and via email, and lasted between 45-90 minutes.

Respondent consent and non-disclosure agreements were confirmed verbally. Depending on the preference of the participant, digital recording was used for accurate understanding of information and internal consistency in interpreting thematic interview contents.

#### Instrumentation

This study employs the following instruments for the qualitative data to be gathered:

- 1) Online cartographic database: CORINE Land Cover
- 2) QGIS Open Source Geographic Information System software
- 3) Semi-structured interview topic guide (see Appendix B)

#### Data Analysis Procedure

#### Geovisualization

To analyze the landscape dynamics of PUA areas, the CORINE land cover changes from urban to non-urban classifications were examined.

Using the *CORINE Land Cover Nomenclature: Standard Guide to Land Classifications*, a reclassification system was devised to redefine the urban and non-urban land covers. The nomenclature has 5 major classes (artificial surfaces, agricultural areas, forests and semi-natural areas, wetlands, and water bodies), with 3 levels of thematic detail. The present study dichotomized the 5 classes into *urban* and *non-urban* uses, but with specific exceptions in some overlapping sub-categories (more details found in Appendix A).

Geovisualization using dissolve tool function in QGIS was used to assign urban and non-urban labels on the original land classes. Urban class was assigned the attribute value 1, corresponding to orange color, while non-urban class was assigned value 2 for green color. This process was done for the spatial scope of both Valencia and Copenhagen in the years 1990 and 2018.

The change in the urban and non-urban cover was then interpreted, analyzed, and related to the broader planning systems at the time.

#### Thematic Content Analysis

This procedure was done on the data gathered through the semi-structured interviews. From the responses, themes and patterns that corresponded to the RQs were identified. The recurring themes such as landscape change, urban expansion, innovations, adaptation, PUA, post-productivism, and multifunctional farming were especially noted, as they correspond to the study's theoretical assumptions in answering the RQs.

#### Analytical Framework

The comparative analytical framework (Figure 5) in this study is an elaborated integration of the theoretical considerations of post-productive agriculture and the researcher's own conceptual framework, showing indicators and variables to be analyzed.



Figure 5. Comparative analytical framework of this study

#### Units of Analysis

This study adopted a qualitative research design that employed interpretive modes of data gathering. The RQ1 treated the PU as a spatially identifiable entity by studying land cover changes and urban expansion. The second question required a deeper understanding of the localized adaptive strategies of the PU farmers, which entailed a thematic analysis of interview data.

Therefore, the two main data sets gathered for analysis were:

- 1) The spatial transformations in the PU areas in relation to land cover changes from urban to non-urban functions; and
- 2) The innovation and adaptation strategies in agricultural practices of farmers

The two data sets are elaborated with their appropriate methods and sampling techniques.

#### Peri-urban Spatial Transformation

• Urban and non-urban land cover change over time (due to peri-urbanization, suburbanization, etc.)

#### Agricultural Innovation and Adaptation Strategies

- Nature of production:
  - Farm diversification activities
  - Civic agriculture / social farming
  - Ecological/organic farming
  - Demand-driven Production
  - Short food supply chain
- Environmental and cultural landscape conservation
  - o Nature conservation/green space provision
  - Land patrimonialization
- Socio-civic involvement
  - o Social movements
  - Interest organizations / NGOs
  - Consumer awareness

#### Data Triangulation

Data triangulation was done for convergence and corroboration of findings to enhance the validity of the outcomes. As a comparative case study, this research was fundamentally heuristic, but guided by a solid theoretical framework. By drawing conclusions on individual cases and comparing them, an in-depth insight of their localized circumstances was conceived. These findings were then related to the broader generalizations of the theoretical framework. From this triangulation between the findings from the 2 cases and the theory, a strong confidence in the conclusions can be then drawn out.

# CHAPTER 5

# Case Studies: Peri-urban Agriculture in Valencia & Copenhagen

This chapter introduces the historical, geographical, and institutional context of Valencia and Copenhagen cases by providing extensive descriptive accounts based on existing studies, in order to guide the present study in exploring the innovations and adaptations in the PUA areas.

#### Case Study 1: Valencia, Spain

#### General Background

The metropolitan area of Valencia is located in eastern Spain, surrounded by the Mediterranean Sea in its western borders. Valencia Metropolitan Area (VMA) in this study is based on NUTS3 code: ES523, metropolitan code: ES003M of Valencia. With around 2.5 million inhabitants (Eurostat, 2019a), VMA ranks third largest in the country, following Madrid and Barcelona. It roughly encompasses 44 municipalities (of more than 25,000 inhabitants), and a total land area of 10,747 km<sup>2</sup> (Eurostat, 2019b). The capital city of Valencia has a population of around 800,000 (PEGV, 2018).

Valencia's economic activity is greatly tied to its tertiary sector. Majority of the share in the GDP is attributed to services (64%), followed by industry (18%), construction (6.1%), and agricultural production (2.2%) (PEGV, 2018). By the second quarter of 2019, the unemployment rate in the Community is at 14.3% of the working population, slightly higher than the national average of 14.02% (ibid., 2019).

The administrative levels of Valencia are shown in Figure 6. Aside from the being the main administrative, economic, and cultural center of the Valencian Community, VMA is also considered an agricultural region and a major tourist destination.



Figure 6. Administrative structure of Valencian Community
# Spatial Context: The Valencian Peri-urban Space

#### Emblematic Physical Landscapes



Figure 7. Landscape of Mediterranean huertasReproduced from *Agricultural Landscapes in Europe and their Transformation* (p. 305) by J.H.A. Meeus, M.P. Wijermans, and M.J. Vroom, 1990, Amsterdam: © 1990 by Elsevier Science Publishers B.V. Reproduced with permission.

The spatial landscape of the VMA is characterized by multiple natural features such as fluvial plains, forests, lagoons, coastal sand dunes, and agricultural landscapes (Figure 7).

The Valencian plain is surrounded by a mountain range, and its metropolitan area is defined by four types of landscapes (Criado, 2009).

- The Turia River lies in the south of the city but dissects the whole metropolitan area from its nature reserve in the western part leading out to the east to join the Mediterranean Sea. Contrary to popular belief, the central city of Valencia is not a coastal one, but rather a fluvial city, as it lies on the northern banks of the Turia River and bound by a natural greenbelt to the east.
- The southern part of VMA has *L'Albufera de València*, a freshwater lagoon separated from the Gulf of Valencia by a sandbar. This sublime landscape brandishes three natural ecosystems: the sand bar, salt and freshwater lakes, and rice fields, and has been declared a nature reserve in 1986 by the Ramsar Convention.
- The sand dune vegetation creates a natural barrier landscape between the Albufera and the Mediterranean Sea.

• The fourth feature of VMA is the *l'Horta de València* (*huerta* in Spanish, orchard or cropland in English), a centuries-old irrigated agricultural landscape that encloses central city, as well as the municipalities in the *comarcas* of l'Horta Sud, La Ribera Alta, La Ribera Baixa.

#### Predominance of Huertas

Of the four main landscapes of VMA, the huertas are considered as the prevailing, as they encompass all other landscapes and outline the city throughout the PU lands. Valencia thus has an intensive PU vegetable production concentrated within or very near the city limits (Péron & Geoffriau, 2007).

Valencian huertas can be characterized according to their values to the public and field experts (Criado, 2009): (a) as a historical landscape with centuries-old water channels and dams, rural road networks, *alquerías Valencianas* (farmhouses of Arab origins), and *barracas* (traditional Valencian houses); (b) as an evolving agricultural activity; and (c) as a territorial bound irrigated by the *Tribunal de les Aigües de València* (Water Tribunal), the oldest judicial body in Europe, mandated to settle disputes on farmland irrigation in the huerta communities. The huertas are then considered a cultural landscape, a testament of human-environment interaction (Moreira et al, 2006) and traditional agriculture practices.

L'Horta serves as a space for both domestic living and food production. It has a major role in maintaining VMA's ecological balance by supporting biodiversity, preventing floods, mitigating climate change effects, and containing urban sprawl within city limits (Melo, 2018). Additional functionalities of l'Horta includes being a recreational space and aesthetic amenity for the urban residents and visitors.

Despite the multifunctional values of the huerta, it has been continuously exposed to urban encroachment that has significantly diminished the coverage of the traditional agricultural lands over the years.

#### Urban Expansion beyond City Limits

A trend of intensified urbanization in the city of Valencia took place in the 1980s, when a series of large-scale urban projects overrode the city. In a span of three decades, the city had linear parks, concert halls, and big avenues leading to the sea, showing that it has completely remade itself from being a "provincial, agrarian city to a regional capital and Mediterranean metropolis" (Prytherch & Boira Maiques, 2009, p. 108). The eastern front of the city went through industrial developments, as it was planned to be the city's corridor to maritime trade in the Mediterranean Sea. Massive investment in Port de València meant to place the city in the center of global maritime trade. The northwestern part of the city was dedicated to business development and international commerce, filled with skyscrapers and commercial hubs. Leading to the end of 20<sup>th</sup> century, Valencia has been transformed and transported into a glorious era as huge investments in cultural and entertainment institutions, universities, metropolitan railway system, subway, tram networks and industrial hubs took place.

The expansive developments, however, did not go without significant spatial trade-offs. PUA lands, traditional industries, and local neighborhoods were compromised by 2 decades of tremendous urbanization that entails growing infrastructure density and urban land expansion (Pitarch-Garrido, 2018). Croplands were replaced by high-end structures. Traditional light manufacturing and wood practices have almost disappeared due to globalized competition. Some neighborhoods have been displaced to make way for new developments.

Consequently, the city now exhibits a predominance of low-density urban sprawl, different from a Mediterranean compact city.

#### Territorial Transformations in the Huertas

Valencia is known to have extensive agricultural lands within its metropolitan areas, not only as a cultural landscape but also as a significant socio-economic livelihood for most PU communities. This position of the huertas, however, makes them vulnerable to urban pressures. Sprawling housing, sporadic industries, and ecological degradation are some of the recent transformations in the huertas (Romero and Melo, 2015). Land abandonment has plagued some of the remaining huertas, which has caused a huge reduction in agricultural production and rise in speculation. The spatial transformations resulted in significant loss of cultivated lands. In fact, the rate of city growth was so drastic that having 23,000-ha coverage in the past, huertas are currently down to 12,000 ha (Melo, 2018).

With these transformations, there is also a social change taking place. The growth of VMA exhibits functional complementarity, meaning that different municipalities have economic diversification mechanisms in the presence of agricultural activities (Salom, 2019). These diversification practices are seen from the changes in the farming practices of the local farming communities due to diminishing and increasingly fragmented agricultural lands.

# A Spanish Peri-urban Agriculture

#### Land and Cultivation Patterns

PUA in Valencia is deeply embedded in its history (Péron & Geoffriau, 2007), dating back to the 8<sup>th</sup> century when the Arabs arrived and built the irrigation system for the huertas from Turia River. Since then, huerta agriculture has been the main economic base of Valencia up until the 1930s (Càtedra L'Horta de València, 2019).

The irrigation channels in the huertas are considered a cultural heritage, that in 2009, the *Tribunal de les Aigües de València* was awarded the UNESCO World Heritage status. PUA in Valencia has a significant cultural value, though largely threatened and often neglected. The huertas are characterized by small plots of land, making open field small-scale farming the primary preoccupation of the PU farmers. Typical produce in the huertas include citrus (mandarin, orange), cereals, melons, rice, and potatoes (Argyelan et al., 2014). The northern huertas and the outer metropolitan area primarily produce citrus fruits that get distributed throughout Spain and northern Europe.

Short food supply chain of organic produce is a prevalent system, but both direct and non-direct selling are done by the small-scale farmers. At least for the vegetable growers, there is a notable absence of cooperatives and collective institutions, and thus the farmers are oriented in individualist marketing (Péron & Geoffriau, 2007).

#### Community Involvement

The huertas have a multifunctional role to its metropolis: a cultural-historical heritage, a biodiversity landscape, and an agricultural-material heritage (Melo 2018). It is in this multi-facetedness that sociopolitical conflicts arose and initiated community involvement in the local city planning and agricultural discourse.

Haphazard housing sprawl and industrial expansions were done without due consultations and dialogues with local neighborhoods and farmers. Planning laws indicate the loss of l'Horta, which sparked public protests (Cabrejas and Garcia, 1997). A prime example of a neighborhood movement that emerged is the *Salvem*, a collective that resisted l'Horta land speculation (Prytherch & Boira Maiques, 2009). In terms of local food system, campaigns supporting organic food production was also a topic for public intervention and gained traction as a major social and lifestyle movement.

Over time, community intervention and civil society movements in VMA has become a matter of agricultural landscape protection (Matarán, 2013) and also a concern of food production and security. Some of these grassroots movements and collectives serve as subjects for the case studies.

# Institutional Setting for Urban and Peri-urban Development

To understand the current state of PU spatial transformations and the change in Valencian agriculture, it is important to acknowledge the policy frameworks and institutional framing of such changes.

#### Territorial Governance

• Metropolitan Level: *Consell Metropolità de l'Horta* (1986-1999)

Local development strategies for Valencia in the 1980s corresponded with the broader autonomous regional strategies, aimed at solidifying a metropolitan region. Valencia was projected to be the central node of the autonomous region, having its urban system built upon a network of fragmented territories (Herrero, 2013).

The formation of *Consell Metropolità de l'Horta* (Metropolitan Council of l'Horta) in 1986 was a start of the supramunicipal authority. It aimed for streamlined strategies for metropolitan development of 44 municipalities in managing transport, water, and spatial planning. In mid-1990s, however, with the new European policy goals of neoliberal urban development, municipal planning was decentralized and polycentric growth for global competitiveness of local territories was encouraged. The council was dissolved in 1999 and by 2001, replaced by sectoral agencies with different municipal jurisdictions (Tomàs, 2017).

The absence of a coordinated planning at the metropolitan scale had serious implications in the agricultural territory of l'Horta.

• Autonomous Community Level: Generalitat Valenciana

Nowadays, the spatial planning and strategic development of the VMA lie within the jurisdiction of *Generalitat Valenciana*, the governing body of the whole autonomous region of Valencia.

From 1995-2015, under a conservative rule, Valencia had intensified entrepreneurial urban policies that forced individual municipalities to find ways to be self-sufficient (Salom, 2019), through inter-municipal competitive goals and isolated project initiatives. At the same time, no metropolitan-scale planning for l'Horta was initiated (Melo, 2018), but instead, unregulated development projects took over the metropolitan area. As a result, the development of VMA was characterized by 'robust suburban expansion... in a territory without a metropolitan model' (Herrero, 2013, p. 462).

• City Level: l'Ajuntament de la ciutat de València

The local city council is in-charge of the territorial planning and local citizen affairs, making sure that regional development goals are in line with the specific developments at the municipal level. The municipal council is also focused in developing and strengthening sustainable food systems at the local level, highly tied to the agricultural and aquaculture activities of the city.

#### Territorial & Agricultural Policy Instruments

• *Llei Horta de València* – l'Horta Law – 2016

With the increased public clamor to protect the huertas, this legislation is a long-awaited concrete move after the 2004 huerta protection plan. This Law delineates a green belt to contain metropolitan expansion within specific areas. Other themes covered by the Law are land transfer and revitalization measures for abandoned and degraded huerta lands, expansion of conserved areas, and a call to adopt a concrete Territorial Action Plan (Melo 2018).

• *PAT: Pla d'Acció Territorial d'Ordenació i Dinamització de l'Horta de València* - Territorial Action Plan of Management and Dynamization of the Valencian Huerta – 2018

This Plan is the concretization of the l'Horta Law that aims to carry out conservation, reclamation, and revitalization of the huertas. Protection against unjust urban development and land speculation, implementation of tools to rejuvenate degraded huerta lands, preservation of traditional farmhouses, and perpetuation of cultural values of the huertas are the main foci of this plan.

• Estratègia Agroalimentària Municipal: València 2025 - Agro-Food Strategy Valencia 2025 – 2017

Initiated by the *Consell Alimentari Municipal* (Municipal Food Council), this serves as the first step to ensure coordinated food policies in the city, in collaboration with the Agricultural Council and public participation. The strategies include themes such as responsible food culture, agroecological transition of food production, food proximity to the city, and territorial planning.

# Case Study 2: Copenhagen, Denmark

# General Background

The Danish capital city of Copenhagen is part of a larger administrative entity called the Greater Copenhagen Area (GCA). Situated in the eastern part of Denmark in the Zealand Island, the GCA is the commuter belt surrounding the urban area of Copenhagen, which also includes some parts of the northern and eastern Zealand. The metropolitan region has roughly 2 million inhabitants as of 2018 (Eurostat, 2019a).

Though Denmark's economy mainly operates in high-skilled labor in the metropolitan region, the country also has a long tradition of agriculture and food production, found in the capital region's PU areas. The northern scape of Copenhagen is a combination of lakes, hilly terrains, forested areas, and open agricultural lands, while the western was a flat agricultural plain (Vejre, 2008). With the advent of modern urbanization in the city-region in the mid-20<sup>th</sup> century, there has been a huge change in the agricultural economic base of Denmark, especially around the PU areas of Copenhagen (Præstholm & Kristensen, 2007).

# Spatial Context: The Copenhagen Peri-urban Space

#### 20th Century City Boom

The decades between 1945-1975 were when Copenhagen consumed open spaces around the city the most, accounting for about 100% expansion in population and territory (Vejre, 2008). The flat agricultural plains surrounding the city offered favorable conditions for city expansion, at the expense of the traditional farmlands, coastlines and forest areas. The drastic sociospatial transformations in the 1940s-50s Copenhagen came with increasing city population, burgeoning industrial sector, and overall economic growth, while leaving the other regions deprived.

The Danish authorities saw ahead the possible effects of overconcentration of development in Copenhagen and acknowledged the ensuing environmental effects of intensified urban expansion. A successive action to generate urban development plans that coincided with nature protection and conservation was started. The famed Copenhagen Finger Plan in 1947 was one of the products of this planning tradition.

#### The Greater Copenhagen Finger Plan

The plan envisions the Greater Copenhagen as "one integrated region, including one cohesive labor market with common green areas" (Galland & Enemark, 2012). The Finger Plan (FP) is the iconic and comprehensive planning document containing the strategies for urban expansion, infrastructure building, and provision of green spaces in Copenhagen and its metropolitan area. The first plan was produced in 1947, with the incorporation of urban and regional development plans in the succeeding decades.



Figure 8. Copenhagen Finger Plan 2015 showing the 4 geographical areasReproduced from *The Finger Plan: A Strategy for the Development of the Greater Copenhagen Area* (p. 29) by The Danish Nature Agency, 2015, Copenhagen: © 2015 by Ministry of the Environment, Denmark. Reproduced with permission.

The FP defines four main geographical areas of interest: the urban core – palm of the hand; peripheral region – city fingers; green wedges – between the fingers; and the rest of Greater Copenhagen (Figure 8). Transportation lines are the bones of these fingers, as the Plan proposes that urban development should proceed along the five regional railways stemming out of Copenhagen to the nearby suburban communities (Figure 9). PUA lands can be found in 3 areas but the urban core.



Figure 9. Main transport lines in the Copenhagen Finger PlanReproduced from *The Finger Plan: A Strategy for the Development of the Greater Copenhagen Area* (p. 13) by The Danish Nature Agency, 2015, Copenhagen: © 2015 by Ministry of the Environment, Denmark. Reproduced with permission.

#### Current Urban Growth and Spatial Transformations

In Copenhagen, PU areas are the pressure point of spatial change, as the rise of metropolitan regions compels rural areas to be amalgamated into the urban system (Fertner, 2012). One of the main drivers of urban expansion is suburbanization, which primarily started in the 1960s (Matthiessen, 1980; Barredo et al., 2003). Projections of urban expansion beyond the administrative boundaries have been formulated, such as the focus on the functional relationship of Copenhagen to the Øresund Region (Fertner, 2006) and its further expansion throughout the rest of Zealand to form one functional urban area (OECD, 2009).

The effect of urban expansion to PU areas can be seen beyond spatial dimension. The farming activities in the countryside have diversified (Praestholm & Kristensen, 2007), and recreational agriculture has also become a trend (Busck et al., 2008).

#### Institutional Setting for Urban and Peri-urban Development

#### Rescaled Planning Regimes: The 2007 Structural Reform

The Danish planning system has been traditionally characterized by top-down governance from national to local level, geared towards spatial coordination more than economic development (EC, 1997). This shows that GCA has been developed in an integrated and coherent framework that operates at all levels of planning institutions.

In the 1990s, the Danish planning system took a major turn in its development trajectory, when global competitiveness and decentralized public governance gained traction in spatial planning policies in Europe. This catalyzed the great 2007 structural reform in Denmark, where 271 municipalities were shrunk to 98 and 13 counties were merged into 5 regions (Capital Region being one of them). The physical spatial planning was bestowed upon local municipal and national government, while the regional administration focuses on economic development and health care (Table 3).

Table 3. Danish planning policy framework after the 2007 reform Based on Galland & Enemark, 2012

Planning Institution		Planning Instruments	
Level	Administrative Body	Type of Plans	Description
National	Ministry of Industry, Business	National planning reports,	Physical development,
	and Financial Affairs;	directives, national	maps and legal documents,
	Danish Business Authority	interests in local plans,	circulars, inter-ministerial
		Greater Copenhagen	agreements
		Finger Plan Directive	
Regional	5 administrative regions	Regional development in	Visionary and conceptual
		economic terms; business	plans
		development strategies;	
		raw materials plan	
Municipal	98 municipal councils	Municipal and	Local policies, land-use
		neighborhood-level plans	regulations, maps, detailed
			physical interventions

The planning of GCA used to be under regional jurisdiction before the reform, and retained its regional-scale spatial planning, but the authority has been transferred to the national government. Initially under the Ministry of the Environment, it was transferred under the Ministry of Industry, Business and Financial Affairs.

The zoning system is categorized into three types: urban, recreational (summer cottage areas), and rural.

#### Policy Instruments

• Planning Act of 2007

This law delegates the task of specific land-use planning and concrete project proposals to the municipal level, with respect to natural conservation measures. Specific aims of the plan include securing integrated and appropriate planning measures among all administrative levels, conservation of structures and landscape of value, upholding natural integrity of coastal lines, and maximized public participation in all channels (Ministry of the Environment, 2007).

• 2017 Finger Plan Directive for Greater Copenhagen

The plan was not officially recognized until the 2007 reform, when the plan became a national directive based on the Planning Act and was integrated to other 34 municipal plans at the time. This directive was then made 'legally binding and spatially explicit' (Fertner, 2012, p. 17).

# A Danish Peri-urban Agriculture

The general situation of the agricultural sector in PU Copenhagen can be surmised as an "on-farm business structure diversification" (Præstholm & Kristensen, 2007), doing specialized production while large-scale production is primarily absent in the agricultural land-use structure of the area. Extensification is also a prevalent practice in GCA, where intensive crop production is replaced by recreational farming.

With diminishing agricultural lands come the different ways of practicing farming. Specialization in small-scale high-value farming systems/cropping patterns, farmers' participation in landscape management and agroenvironmental measures, and diversification in recreational services and lifestyle-oriented farming show that the Danish agriculture has taken a step further in the post-productive paradigm (Zasada et al., 2011). The decreasing pervasiveness of intensive agriculture is correlational to the increase in diversified practices in PU farms (Busck et al., 2006).

Climate change adaptation plans and food quality debates (Byrne, 2001), and the implications of PU food production to urban resilience (Olsson et al. 2011) also dominate the state of agriculture and farming in the Danish PU case.

# CHAPTER 6

# **Results & Analysis of Data**

This chapter presents the data collected through spatial analysis and semi-structured interviews during a fourmonth fieldwork in the PU areas of Valencia and Copenhagen.

The chapter is divided into three sections; (1-2) the presentation of spatial transformations and state of PUA in the selected cases, and (3) the comparative analysis of the spatial, socioeconomic and structural dimensions of PUA in the two regional contexts.

In the first and second sections, the presentation and analysis of results focus on the following points as indicated in the RQs:

- RQ 1. Spatial transformation showing the change in the urban and non-urban use
- RQ 2. Descriptive accounts on agricultural innovation and adaptation strategies ensuing in the PU lands

The third section presents a comparative analysis of the two cases, aimed at defining patterns, deviations, and context-specific conditions for the adaptation strategies.

In general, the gathered data are presented in the form of maps, pictures, and tables.

# Case Study 1: Valencia Metropolitan Area

### **Policy Setting**

#### Huerta Policy Tools

According to Mr. Brown, there is an existing law for huerta protection – but only for the lands considered croplands. This law has 3 branches, as presented in Table 4.

Table 4. Law branches for huerta protection(according to Mr. Brown)

Branches of Law	Description
<i>Plans d'Acció Territorial (PAT)</i> Territorial Action Plans	Includes plans for different territorial units (town/comarcas, metropolitan region, functional urban areas, nature reserves)
<i>Pla Desenvolupament Agrari (PDA)</i> Agrarian Development Plan	Employs highly participatory schemes for agrarian development of the Community
<i>Consell de l'Horta</i> Huerta Council	The administrative body focused on the huertas, but only as far as PAT and PDA are involved; consists of representatives from the Agriculture Department, 45 towns, and civil associations

(personal communication, May 2019)

There is a specific and traditional system to demarcate the huerta lands, called the Comarca el l'Horta, which is the specific focus of the PDA. As these are historical assemblies, they do not have official representations or administrative bodies, but are still used as basis for the local-level planning of the regional government.

In the current agrarian development plan of the huerta which Mr. Brown is currently working on, the main challenge is to coordinate and hold consultations with all the comarcas enclosed in the metropolitan plan, in order to draft a comprehensive agricultural regulation for huerta protection at farm-level. One example is the provision of local police to patrol the farm fields to prevent looting.

This shows that even though comarcas are not recognized administrative bodies, they are still considered the basic unit in the decision-making process. However, as they are not organizationally represented, gathering willing participants for consultation from each comarca can be arduous and time-consuming.

#### Challenge in Planning at the Metropolitan Level

*"There should be a strong will from the city council to implement comprehensive strategic regional planning."* (J.G., 2019)

The absence of a definitive metropolitan governance body in the Valencian Community is a major challenge and could be a contributing factor in the weak local- and farm-level implementation of spatial planning framework. Even though there exists a regional strategic development plan and a supra-municipal structure of governance

(concerning comarcas), there is no explication of planning rules and an official governing body at a metropolitan scale. All issues regarding a functional metropolitan area under the regional government.

The lack of a solid metropolitan model puts the PU huertas at risk even more, as weak/ambiguous regulations in urban development still plague the planning policies.

# Spatial Transformations

#### Land Cover Changes from CORINE

Using QGIS, the spatial transformations in VMA are visualized in Figure 10 and Figure 11. Both illustrations show the urban and non-urban land cover change in a span of almost three decades.



Figure 10. VMA urban and non-urban land cover, 1990 Dataset processed from CORINE Land Cover



Figure 11. VMA urban and non-urban land cover, 2018 Dataset processed from CORINE Land Cover

These changes coincide with the major reforms in governance and urban policies in the mid-90s, when spatial planning was decentralized to local communities and economic policies were subject to deregulation and competitiveness. With the dissolution of a distinct metropolitan governing council, the expansion of VMA is characterized by heavy sprawl and suburbanization.

A major implication of VMA sprawl is the urban consumption of the huertas in the PU areas, which demonstrated a considerable land cover decline in the past decades

#### Agricultural Lands to Industrial Uses

In the 1990s, there was an increasing awareness of the housing bubble and building boom, resulting in rapid urban expansion of Valencia (J.G., personal communication, May 2019).

A more recent controversy about the urban expansion, was the *Plan General de Ordenacion Urbana* (PGOU) in 2014, having 400 hectares of land being lost to the *Zona de Actuación Logística* (ZAL) of the Valencia Port Authority, in the historical huertas of La Punta district (ibid.). ZAL is the perfect example of fragmented planning in Valencian patrimonial huerta lands. A presentation made by Per l'Horta movement (see Figure 12-Figure 15) shows that despite the recognition of traditional PU huertas in the regional and municipal planning documents, the current expansion proposals of the Valencia Port Authority still imply industrial encroachment in the huertas.

As of the interview (May 2019), there has been an ongoing Court of Justice appeal launched by Per l'Horta to impede further expansion of ZAL.



Figure 12. Overview of the huertas surrounding the city of ValenciaReproduced from *Poder i Contrapoder en El Territori: Qui Mana del Territori? On* és la Decissió Democràtica? Ciutadans o Súbdits? (p. 9) by Per l'Horta, 2019, Valencia: © 2015 by Per l'Horta, Valencia, Spain. Reproduced with permission.



Figure 13. Green Infrastructure system in the strategic and territorial plans of ValenciaReproduced from *Poder i Contrapoder en El Territori: Qui Mana del Territori? On és la Decissió Democràtica? Ciutadans o Súbdits?* (p. 10) by Per l'Horta, 2019, Valencia: © 2015 by Per l'Horta, Valencia, Spain. Reproduced with permission.



Figure 14. Proposed nature belt (sea, beach, huertas, river, natural parks, and the city) by Per l'HortaReproduced from *Poder i Contrapoder en El Territori: Qui Mana del Territori? On és la Decissió Democràtica? Ciutadans o Súbdits?* (p. 26) by Per l'Horta, 2019, Valencia: © 2015 by Per l'Horta, Valencia, Spain. Reproduced with permission.



Figure 15. Proposed ZAL expansion into the huertas of La Punta districtReproduced from *Poder i Contrapoder en El Territori: Qui Mana del Territori?* On és la Decissió Democràtica? Ciutadans o Súbdits? (p. 27) by Per l'Horta, 2019, Valencia: © 2015 by Per l'Horta, Valencia, Spain. Reproduced with permission.

In the current state of political affairs in Valencia, the huertas are the most vulnerable. Without public intervention and involvement of the local citizens, relentless land conversion would continue to threaten the patrimonial territory of the PU huertas. Evidently, PUA in these huertas are the ones taking the heaviest blow, as their livelihood gets threatened as well. On this note, certain agricultural innovation and adaptation strategies are systematically being employed by PUA actors as a response to spatial and political disruptions

#### Peri-urban Agricultural Innovation & Adaptation Strategies

#### Valencian Peri-urban Agriculture in a Nutshell

When asked about the current state of PUA in Valencia, described it as "a promising practice" (J.G., personal communication, May 2019), being guided by sincere political objectives, but clearly suffering from inadequate policy implementation, fragmented spatial planning, and risky public-private partnerships the Valencian planning authorities are engaged with.

The Valencian agriculture production is a targeted to wide varieties of consumers in and out of the city and of Spain. There are different lines for commercialization, but no fixed targets, as the PU farmers have a variety of customers at different scales of production (P.L., personal communication, May 2019). There are the Los Mercas in all Spanish regions, mercas in each city, and small-time direct selling markets in local municipalities. One example of a direct-selling organic producer is the collective Aixada com Eixida, which will be discussed in succeeding sections.

Local production in the huertas, however small in relation to the food consumption of the city, should still be recognized as a pivotal space for agroecological production. It is not yet in the state of production, but instead an agroecological transition trying to reach the post-productive state (ibid.).

# Multifunctional and Innovative Agriculture

• Diversified crop production

A conventional farmer would have four to six varieties of produce throughout the year (crop rotation), but an agro-ecological farmer would have twelve crop types in these small plots of lands.

#### Diversification of crops is a prevalent practice in Valencia, as the land structure is "minifundis":

"...no big lands like haciendas, but small properties. More than half of the lands are less than 3 hectares, so the initiatives in the peri-urban areas are little and focused on the small-scale innovations." (P.L., personal communication, May 2019)

One problem with minifundis is that most of these plots are not productive. So, the municipality launched *El Banco del Tierras*, a platform for non-productive lands to be promoted for renting to young farmers who do not have lands but want to practice agriculture. As land abandonment is a prevailing issue in these minifundis huertas, having the *Banco del Tierras* platform is an innovative move to encourage PUA especially to young farmers.

The current structure of the huertas is a vital factor in the prevalence of diversification in PUA. With smaller lands, diversification of crops is the most favorable approach to sustain PUA while maintain an ecologically-sound practice.

#### • Civic agriculture and social farming: *Horts Urbans de Benimaclet (HUB)*

J.G. showed an example of how civic agriculture is practiced in the fertile lands in between the housing developments – the Benimaclet Urban Orchard.



Figure 16. Local vegetable plots in Benimaclet, ValenciaMay 6, 2019

The urban garden plot is managed and advocated by a local neighborhood association in the district of Benimaclet. The garden borders huge housing estates (Figure 17) and Bulevard Perifèric Nord.



Figure 17. Horts Urbans de Benimaclet: civic agriculture in Benimaclet, ValenciaMay 6, 2019

This is one of the many orchards lying in the plots of lands surrounding major motorways and the city. Different produce can be found here, such as lettuce, rosemary, oregano, cabbage, and aloe vera, mostly for personal consumption. They also provide insect hotel for biodiversity and outdoor benches for community gatherings.

An exceptional section was made for a school plot, as this provides fresh food supply to some school kitchens with free feeding programs. This huerta can support the local community, especially by providing fresh food supply to school kitchens with free feeding programs. Plot acquisition in Benimaclet is done through a list-basis, very much like social housing programs, but priority is given to entities with civic objectives, like the schools.

HUB is a prime example of civic agriculture, having locally-sourced organic food production for the need of the immediate community.

Organic Farming

Different innovations and strategies have been implemented, both in agricultural policies and the actual practice, to support ecological farming in Valencia.

### o Sistema Participativo de Garantía (SPG) - Ecollaures

A farming collective formed 5 years ago, SPG-Ecollaures serves as a certifier for the local producers to strengthen their consumer base. The certification ensures the consumers of ecological practices employed in the cultivation of farm produce. It protected both the farmers and consumers and was later subsidized by the government to further support young farmers. "The municipality recognized the SPG as a legitimate certification system – an innovation [in agroecological production]," as described by P.L., a sociologist from CERAI (personal communication, May 2019).

#### o l'Aixada com Eixida

L'Aixada com Eixida is an agroecological farming collective with mainly 4 people (working by pair) on the ground. R.S., one of the farmers in the collective, admitted that there is not enough livelihood in farming, so the progress is slow. The farmland, located in the town of Picassent 20 km outside of the city, has 1.5 ha of cropland rented from a private owner. The area consists of a residential house, kitchen, outdoor oven and a planting area. The crops vary all year round, including grapes, olives, berries, citrus fruits, and vegetables.



Figure 18. Farming plot in l'Aixada com Eixida in Picassent, ValenciaMay 8, 2019

The collective is one out of 45-50 projects of SPG-Ecollaures. It has diversified array of activities, including sustainable organic farming, educational drives (dialogues with consumers, school seminars and talks about ecological farming), culinary classes (baking), and *banco de paja* – the annual practice of removing contamination

in the old rice paddies in preparation for new crops. There is also a regular open-farm, inviting school children to visit the farm and learn basic planting techniques.

The collective also practices a form of short food supply chain, supplying fresh produce for 30-50 families as regular consumers. It aims to have a close relationship with its consumers through confidence and trust. The only future goal of the collective is to upscale the production in such a way that consumers don't come back on a weekly basis, but rather on a longer duration, thus making the farm work less tedious. This practice is only to sustain farming, but no aim of expanding "like the capitalists do" (R.S., 2019).

- Short food supply chain and direct selling
  - o Eco-Maclet: An Urban Space for PU Farmers

"...it's projected that in 3 or 4 months, there will be 3 farmer markets in the city, only with agroecological farmers. The municipal level gives the concession of public space...for 25 years... This is the government trying to innovate in the governance of the markets." (P.L., 2019)

The municipal law *El Plan d'Agricultura i Territorio* called for a provision of urban space for the PU farmers, by putting up farmers' markets inside the city. With the 25-year concession, this ensures that even if the government changes, the farmers markets will remain functioning.

Eco-Maclet is a social initiative; an ecological farmers' market with an agreement with the municipality to hold a market once a month in Benimaclet plaza:

*"Benimaclet is an alternative neighborhood with young people. There was a social initiative called Eco-Maclet, an agrocecological market that opens once a month. This was a collective of consumer groups, farmers... a social initiative. This is a co-governance between the Co-governance between the social movements and the municipality"* (P.L., 2019)

The government sees Eco-maclet as "a move from the social precariousness of market to a regulated market" (ibid., 2019). Direct selling of ecological products and short food supply chains is enforced in this initiative.

o La Tira de Contar: Historical Direct Selling

An institution with historical practice of direct selling dating a century ago, La Tira de Contar is trying to valorize organic and fresh PU products. This used to be a circulating market but has found its permanent space in Mercavalència. PU farmers from the comarcas of l'Horta come here to sell their produce, and this is the shortest organic market channel in Valencia.

#### Environment and Cultural Landscape Conservation

The huertas undoubtedly possess historical values and cultural heritage for the Valencian people. Additionally, huertas offer are range of environmental potential, and as J.G. mentioned, it can help with land irrigation and

flood water regulation, fresh air for the residential areas, and as a green buffer zone between the industrial and residential areas (personal communication, 2019).

The environmental component of the innovation and adaptations strategies of PUA actors is one comprehensive, cross-sectional element, as it can be observed at the spatial planning level (PU territory), structural level (agricultural policies), and in the practical dimension of agriculture (innovations and adaptation strategies).

#### Socio-civic Involvement in Food Systems and Land Protection

• Local farmer collectivization

P.L., a sociologist from *Centro de Estudios Rurales y de Agricultura Internacional* (CERAI), explains that Valencia has a problem in representative institutions for the farming sector. To start, there are two types that exist:

Conventional huerta farmers	Incipient agroecological farmers
"they are not collectivized but claim that they	"politicized, collectivized, and militant, but they are
represent the majority of the farming population"	very few and not so professionalized"
	"they are the space of innovation and
	collectivization, but they don't have a very big
	impact in the economy"

Table 5. Two types of farmers in the Valencian huertas

(personal communication, May 2019)

With the *Estratègia Agroalimentària Municipal*, a policy launched in 2015 containing the city strategy to advance agroecology, the Valencian municipality recognized that support should also be given to the conventional local farmers to transition into agroecology.

The program *Mans a l'Horta* is an innovative initiative stemming out from this policy action. The program contains three territorial dynamization projects in the three selected areas of the huerta – in the north, west, and south. The goal of this program to help conventional huerta farmers to transition into agroecological practice. Subsidies are channeled through three accredited social organizations in the areas to launch a process called "investigation-action-participation" to evaluate the farmers' needs.

• Inter-city collaboration: Red de Ciudades por la Agroecología

The Network of Cities for Agroecology is a collective of local Spanish administrations having a common goal of transforming the food system, in which Valencia is a member of. Through knowledge exchange and common food policies, the member cities can learn from each other towards agroecology and sustainable rural-urban partnerships. The current *Banco del Tierras* is an example of this exchange, as this is a new practice in Valencia adapted from the traditions in northern Spanish cities.

This initiative implies that farmer collectivization in Valencia is focused on converting conventional farming into a more sustainable and ecological type of farming.

• Territorial protection: the Per l'Horta Movement

The movement, stemming out of the *Iniciativa Legislativa Popular* (ILP), was founded in 2001 after a growing clamor against relentless urban sprawl in the huertas of Valencia. The Per l'Horta Movement is a catalyst for change, creating cross-sectional synergies in different aspects:

- institutional (policy-making, spatial planning)
- o political (democratic community participation, people empowerment)
- o cultural (huerta heritage)
- socioeconomic + environmental (agroecology)

Urban expansion is the main driving force for the actions of Per l'Horta; with projects such as motorways and highspeed railways systems, that tend to fragmentize agricultural lands. The expansion been so drastic in the past decades, that public uproar triggered creation of citizen movements wanting to protect the natural and agricultural landscape of Valencia. The main urban developments that catalyzed Per l'Horta's formation are:

- the canalization of the River Turia (completed 1969), displacing people and damaging property
- PGOU in the '60s-'80s, characterized by massive expansion of the Valencian city limits to the PU outskirts
- The 2000s housing bubble that lead to the financial crisis

The movement has connections with different local associations and institutions that have aligned principles and objectives, such as the Water Tribunal.

The main programs of the movement involve lobbying to policymakers, mayors, and political parties regarding regulation of urban expansion and encouraging public participation in decision-making.

As a catalyst movement, Per l'Horta relies on volunteers, and the main challenge for the movement is funding in legal proceedings and hiring experts for feasibility studies and position papers for the protection of l'Horta:

*"The movement aims to proact instead of react to parliamentary and institutional struggles."* (J.G., personal communication, May 2019)

Nowadays, the movement is still working on institutionalization, to become a legal body.

# Summary

It could be argued that the Valencia presents a strong case in highlighting the opportunities for revitalizing PUA, reinforcing landscape management, and fostering public intervention in policy-making. There is a strong connection between the territorial and agricultural discourse in the case of Valencian huertas. The territorial/spatial debate is a two-decade old one, while the discourse in agroecological transition just started four years ago, with the launch of *Estratègia Agroalimentària Municipal*. The gap between the two discourses can be bridged by structural policies. Integrating the two (peri-)urban agendas towards a sustainable metropolitan development can be done with strong political will pushing for a comprehensive, strategic, and inclusive development of Valencia.

# Case Study 2: Greater Copenhagen Area

#### **Policy Setting**

#### 2007 Structural Reform Implications in Agriculture

The land governance and planning in (GCA) was highly influenced by the municipal and regional structural reform in 2007. An urban planner from the Danish Business Authority J.J. said that a major implication of such reform is that the regions were stripped away of their authority in spatial planning issues, with small exceptions regarding raw materials.

The only regional planning practice retained was that of GCA, with the continued tradition of the Finger Plan. Until 2007, the spatial planning and management of the metropolitan area was placed with the regional authority called the *Hovedstadens Udviklingsråd* (HUR - Greater Copenhagen Development Council). From 2015, it has been placed within the jurisdiction of the Danish Business Authority, under the Danish Ministry of Business and Growth operating at a national level.

In the current FP 2017, J.J. posits that peripheral agricultural lands have no significant role in the reform negotiations on the plan. For the longest time, agricultural lands have been under the three types of geographical areas identified in the FP, but the urban core. This means that agricultural lands have no specific land-use classification, because they can fall into the peripheral-urban, green wedges, or urban outskirts of GCA (Table 6).

Finger Plan Geographical Areas	Agricultural lands?	Description	Examples
Urban core (palm of the hand)	No	No significant agricultural lands	
Urban periphery (urban fingers)	Yes	The areas surrounding the rail lines, having existing urban built- up areas and future development sites	Example: Hillerød finger, where there are agricultural lands that would someday be developed into housing areas within the urban finger
Green wedges (space in between the fingers)	Yes	Thought of as main green areas that can be used for recreational purposes + areas that are situated between the 5 urban fingers	Some of these green areas are forests, lakes, parks, etc., but also used for agricultural purposes – farming, horses, grazing, etc. This is a minor agricultural land use

Table 6. Agricultural lands in the Greater Copenhagen Area

Urban outskirts /		Where the main agricultural	To the north, west, and south of
the rest of GCA (area outside the fingers)	Yes	areas can be found – In the outskirts of the fingers and green wedges	Copenhagen, these are areas where one finds small towns and villages

Elaborated by J.J., personal communication, Aug 2019

The zoning system, on the other hand, circumvents the FP, as there are only three zoning categories recognized by the national planning authority: urban, non-urban, and summer cottage areas. This trichotomy presents a very simple system, but also makes it hard for the land use changes to be approved and implemented, as different regulations apply to these categories.

Both the geographical classification and zoning system implies that while agricultural lands are not a significant component of the spatial planning strategy, sudden conversion of agricultural to urban uses cannot be easily carried out due to strong adherence to the FP.

#### The Greater Copenhagen Spatial Planning System

The FP's main principle is to concentrate urban expansion in GCA mainly in the branch of the fingers in connection to S-trains, coastal trains, and metro to encourage public transport. Public transport means lower traffic congestion and environmental impact:

"We want to avoid urban spraw!... we try to concentrate the build-up in the fingers and in the hand... outside them, we try not have much urban development in order to have space for agriculture, but also in order to save land, protect landscapes and environmental assets, and to maintain areas attractive for recreational purposes." (J.J., personal communication, Aug 2019)

From the 1990s, Copenhagen has seen drastic growth in population. In 1995, almost 270,000 people moved to the city and in 2030, another 200,000 influx is projected. This almost half a million increase in a span of 35 years, for J.J., creates a big pressure in finding more lands for housing. This caused the landowners in the city fingers, in the Northern Zealand for example, to pressure the ministerial government to intensify its campaign for urban development more than what is allowed based on the FP.

The current state of spatial planning in GCA, then, is characterized by a strong following in the FP. A reverse reaction can be seen from the local regional municipalities, as they push for urbanization in their rural peripheral territories.

# **Spatial Transformations**

#### Land Cover Changes from CORINE



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Figure 19. GCA urban and non-urban land cover, 1990Dataset processed from CORINE Land Cover

Figure 20. GCA urban and non-urban land cover, 2018Dataset processed from CORINE Land Cover

Using QGIS, the spatial transformations of the metropolitan area are visualized in Figure 19 and Figure 20. The maps present the urban and non-urban land cover change in a 28-year span.

At first glance, there seem to be a significant increase in the non-urban areas in the southern part of GCA, near the urban core. This can be attributed to the extensive greening measures pushed forward by local administrations in the 90s, that only strengthened the regional and local level coordination in spatial planning.

This increase in the non-urban land cover may not necessarily correspond to the increase of PU farmlands, but nevertheless shows how the formalization of the FP in 2007 could have cemented a dramatic spatial change in the area. Additionally, sporadic urban build-up, and small appearances of new urban lands can be seen in the central, northern, and western part of GCA, which meant that there may have been some instances of land conversion and artificial expansion there.

#### Mitigating Urban Development Pressures

In the last ten to fifteen years, there have been heated debates about the regional areas of Jutland – not so much in GCA – being in constant decline, such as schools closing, office spaces moving to larger cities, and farms closing and centralizing in bigger farms. Various municipal governments attempt to alleviate this decline, or even reverse it, through by making regional areas more attractive to investments, such as lower tax charges, improved broadband connection, cheaper transport, and support to business developers (J.J., personal communication,

Aug 2019). This created public pressure and political debates, not only in Jutland but also in the GCA, to make spatial planning less restrictive about land use conversion.

As a result, small steps to liberalize planning and zoning systems have been considered, to allow more urban development in the peripheral areas of GCA. By liberalizing planning, companies can build, and families can buy houses and generate business in rural areas. This is the central issue in the current reform of the FP.

However, J.J. speculates that this will not be the case in the coming years:

"...some areas will have some development in selected peripheral areas, which will take place often in lands currently used for agricultural purposes. But I would like to stress that these steps for liberalizing planning have not been very dramatic, so I'm not expecting a huge outburst of urban development. But we will have some urban development in the future." (personal communication, Aug 2019)

The farmers were silent on this issue, as they can also benefit from the land conversions – to use former farms for various economic purposes. Those who expressed opposition were for the principal reason that these small developments may be precedent of future unregulated expansion.

The debated PUA spatial transformations are not the main concern of the planning authorities, even less about the looming likelihood of liberalizing urban planning in the region. Copenhagen still has "a relatively strong regulation of land use outside the city, compared to other metropolitan areas in Europe," (J.J., personal communication, Aug 2019) and the strong division between urban areas and non-urban areas can help mitigate the impending threats of urban sprawl.

#### Agricultural Lands to Urban Uses

The Danish National Planning Act stipulates that when zoning transfer and land conversion are desired within a specific area, it is under the jurisdiction of municipal authorities to hold local consultations and draw up planning proposals for such change. On another note, a property must be at least two ha to qualify as an agricultural land, as stipulated in the Act. This "ensures that every known agricultural property in Denmark is kept in an agricultural state" (C.B., personal communication, Aug 2019) and protected from land conversion.

When asked about the salient agricultural land conversions to urban functions in GCA, J.J. said there have been a few cases in North Zealand and west of Copenhagen but with negligible extent, as these conversions were more of an expansion of minor cities:

"...but again, these areas are relatively small. These were done around already existing urbanized areas. We have not created new satellite developments in the middle of nowhere."

Additionally, PUA in GCA is not a pressing issue, as urban expansion is restricted within the city.

*"If we are to convert agricultural lands, it would be the ones already inside the fingers. I don't expect that we will take out a lot in the near future, but it's of course difficult to predict the distant future."* (personal communication, Aug 2019)

#### Peri-urban Agricultural Innovation & Adaptation Strategies

#### Greater Copenhagen Peri-urban Agriculture in a Nutshell

GCA's PUA, as far as large-scale farms are concerned, is found in the outskirts of the urban fingers. In an email interview with an officer from the Danish Agricultural Agency, the general structural trend of Danish agriculture is characterized by ever larger fields but fewer farms (C.B., personal communication, Aug 2019). A production manager of a mushroom farm also noted that in the metropolitan area of Copenhagen, small farms are almost non-existent (O.K., personal communication, Aug 2019).

These big estate farms are indirectly connected the urban society, because they produce for bigger supply chains like supermarkets, and they seldom partake in direct marketing (P.K., personal communication, Jul 2019). This holds true for the Hovholm farm owner, L.T., as he admits he does

The general picture of Danish agriculture nowadays is oriented towards green transition. With ecological production practices (i.e. organic farming) and a stronger regard to farmers as stewards of farmlands and open nature landscape, extensive greening initiatives will be reflected in future agricultural reforms (C.B., personal communication, Aug 2019).

#### Multifunctional and Innovative Agriculture

• Diversified farm activities

In large farms in Denmark, such as L.T.'s 900-hectare property called the Hovholm Farm, it is common to practice both conventional (intensive) and organic farming. However, he admits that doing organic farming produces 20% more CO<sub>2</sub> emissions, as well as more manual labor for harvesting, since it uses more diesel in manually driven tractors compared to GPS-controlled ones (personal communication, Jul 2019).

L.T. also partakes in non-agricultural activities in order to diversify his income sources:

"I tried to be modern but not only in farming because we also do other business. We are also salting roads, building houses and swimming pools... we do a lot of things because we are close to the city. That was a big part of developing this farm; doing other activities to support the farming production." (personal communication, Jul 2019)

In his diversification strategy, he managed to retain the same labor from the farming, thus securing an all-year employment for his farm staff. This was not the case thirty years ago, when seasonal employment was practiced. His diversified practice also gives him double return from his tractor investment: "...the tractors used in the summer for farming can be used in the winter for salting so that's actually a practical way to make use of our investments." (personal communication, Jul 2019)

When asked about his opinion about urban expansion in his lands, he sees urbanization more as a window of economic opportunity than a threat to his lands:

"many of my colleagues do [see urbanization as a threat]. But I don't. I do salting roads in the wintertime, we make golf courses and so on and I couldn't do that if urbanization wasn't there... in 10 years' time they will start building houses in here; it's a very very good pension fund. So, urbanization makes the value of my land even higher." (personal communication, Jul 2019)

From these views, it might be surprising for a PU farmer to support further expansion in his lands, but this also backs the account of J.J. that farmers have been silent in the debate about urban developments in peripheral lands. This can be due to the farmer's awareness of speculative land market, or their complete confidence in the government to fairly (or even better) compensate the potential expropriated private farmlands lands for future urban developments. In any case, the FP serves as a safety net for these land conversions to be avoided to begin with.

• Demand-driven and high-value production

L.T.'s demand-driven production is directed towards his big clients, namely the global brewery Carlsberg and Europe's biggest farm supply company DLG. His yields of barley go to Carlsberg; rye goes to Sweden; and oilseed rape goes to Germany. There is no surplus in his crop yield, as everything he grows is intended for the precise demands of his buyers.

Same system can be seen with Beyond Coffee, a start-up business based in Copenhagen. Having acquired a patent from Rotterdam, Netherlands, its business model entails growing mushrooms from used coffee grounds. O.K., production manager of the enterprise, said that there is no overproduction at the end of every batch, as they provide their clients with constant supply.

"As of now, there is no prospect of upscaling. We keep the production scale sustainable and manageable." (personal communication, Aug 2019)

Beyond Coffee also exercises high-value cropping system. They sell the mushrooms at a higher price to select restaurants in the city, because of the added value in the organic production process their produce entails. Additionally, they are experimenting on diversifying the kinds of mushrooms they sell, considering venturing on exotic ones for a much higher value. In the end, "it is the story that sells" (O.K., personal communication, Aug 2019).

#### • Ecological farming

Though only 20% of his total turnover can be attributed to farming, L.T. still hopes for an ecological transition of his farm:

"...part of the development of this farm is to be more and more organic in the future." (personal communication, Jul 2019)

For Beyond Coffee, the promotion of circular economy can be seen, as it uses coffee grounds from donors to grow their mushrooms. This is one example of making the city self-sufficient, and to keep the city waste within its limits, and use it to do something that wouldn't be normally done in a city – such as farming.

Ecological farming and direct selling can also be done in large-scale. From an interview with J.B., a member of the organic food cooperative in Copenhagen called *Københavns Fødevarefællesskab* (KBHFF), a biodynamic farm in north-western Zealand called *Birkemosegård* is the cooperative's main supplier. The owners of the farm frequent the city on a weekly basis for provision of fresh produce in organic stores, some supermarkets, and restaurants (personal communication, Jul 2019).

#### Environment and Green Landscape Conservation

"We [Danish Agricultural Agency] are confident and find that the future looks bright because nature, the environment and agriculture are each other's natural preconditions." (C.B., personal communication, Aug 2019)

Policy provisions

Nature conservation became a primary issue with intensive cultivation in the ever-growing fields and farmlands. Serious environmental implications, such as soil and water pollution became prevalent in the 1990s and 2000s, when modernization of farm industry gained traction. Thus, with collaborations between the Danish Agricultural Agency and environmental organizations, a specific provision in the Danish agricultural law was introduced to allow farmers to dedicate a certain part of their agricultural lands to biodiversity (C.B., personal communication, Aug 2019).

• Green incentives for farmers

In the Danish context, which is also the case for the rest of Europe, there is no difference in hobby farmers and full-time farmers in the eligibility criteria for receiving funding, so long as basic conditions for agricultural aid are met, such as having at least 2 hectares of land used for cultivation.

From 2014, incentives (such as the *green supplement* in the EU direct payment) were given to farmers who add value to nature and biodiversity. C.B. (personal communication, Aug 2019) recounted a high-profile local initiative in 2018 that laid out flower stripes in agricultural areas to induce pollination and fauna creation in Danish country roads. An environment collective called *Faunastriberne* was formed from this collaboration between farmers, green organizations, and municipalities.

On the same note, as a farmer with primarily traditional techniques, L.T. receives an annual subsidy from the EU for participating in the EU green transition, by growing oilseed rape to be used for biodiesel (personal communication, Jul 2019). His wheat export in North Africa, such as Egypt, Algeria, and Libya, also gets subsidy from the EU.

• Cross-sectoral and transnational collaborations

The Danish Agricultural agency collaborates and holds regular dialogues with different business organizations, green associations, outdoor councils, farmers, municipalities, and local citizens to constantly improve the agricultural regulations.

In the coming agricultural policy reform in 2021, all EU member states are required to draw up specific provisions regarding climate, environment, and nature, and Denmark is on its way to empowering and incentivizing its farmers for their green initiatives in these areas (C.B., personal communication, Aug 2019).

#### Socio-civic Involvement in Food Systems

The green transition in Denmark would not be possible without the demand of the consumers for "greater ownership and innovation of European agriculture" (C.B., personal communication, Aug 2019). With the growing citizen participation in decision-making, grassroots organizations and local communities began to be consolidated and get actively involved in the Danish agricultural policy-making towards a more sustainable food system.

• Producer-side empowerment: Økologisk Landsforening (ØL)

One manifestation of this green transition is the formation of associations promoting ecological agriculture. An interview with P.K., chairman of ØL - Organic Denmark showed that organic transition in Denmark has a strong political traction, focused at programs to develop not only the farmer's expertise in ecological farming, but also the market demand for it. Working primarily in the GCA, the programs for the farmers focused on integrating them into the local market community, and to make their practice more socially viable:

The need for an alternative producer and consumer system that counters the unpredictable globalized market system is central to ØL, and P.K. put it:

"We have to establish this kind of new market which gives the farmers...possibilities, which gives the consumers...products with more identity. If we can manage to develop that, we can also manage to develop a food system with a much higher kind of resilience and sustainability in a world where the global situation could change." (personal communication, Jul 2019)

• Consumer-side empowerment: Københavns Fødevarefællesskab (KBHFF)

From the consumer side, J.B. of KBHFF – Copenhagen Food Community aligns with P.K.'s propositions that there should be a shift in the way people consume. This mindset change has been happening for the last 5-10 years, with people seeing through "what is sustainable not only for themselves but also for the planet itself." (personal communication, Jul 2019).

KBHFF as a member-based consumer cooperative supports direct selling, by contracting organic and biodynamic farms in PU Copenhagen as direct suppliers for their store. The produce are locally sourced from farms within a

50-km (or so) distance radius from the city, to minimize transport cost and carbon footprint of transporting the goods.

The business model of the cooperative operates through weekly by-order bags of fresh fruits and vegetables that members have ordered a week before. This ensures a demand-driven production, though the consumer cannot choose, for now, which kinds of fruits or crops gets included in the bag.

The two collectives come from the different sides of the food system but are clearly on the same side in the green transition and sustainable development of the Danish PUA.

# Summary

In a country where majority of the population lives in urbanized areas, Danish lands are still dominated by agricultural lands. In this regard, there is a huge responsibility in the planning and agricultural authorities to enforce strong land use regulations to preserve agricultural lands, and at the same time respond to the urban pressure to provide more lands for development and expansion.

In the case of GCA, there is an increase of lands reserved for recreational and nature purposes around the urban core, while at the same time having sporadic urban growth as one reaches the city periphery. The innovative and adaptation strategies found in PUA actors include diversified farm activities, high-value production and ecological farming. There is also a prevalence of environmental consideration in urban policy and PUA. A strong political involvement of civic organizations can also be observed, and agricultural agencies have strong ties with the local stakeholders. Thus, a rich platform for the multisectoral collaboration is formed, which paves way for a robust and balanced urban-regional development in the future.

# A Comparison of PUA in Valencia and Copenhagen Metropolitan Areas

From the articulations of individual cases in the last two sections, the table below summarizes the most salient insights from the two cases. Guided by the analytical framework, the comparative facets and elements indicate the state of post-productive transition of the two metropolitan areas.

Table 7. Com	parison of	cases in	post-pro	oductive state

POST-PRODUCTIVE TRANSITION		CASES	
Facets	Elements	VALENCIA	COPENHAGEN
		no clear metropolitan model; VMA territorial boundary is implicit in the planning documents	no unified delineation of metropolitan area; GCA is based on the incremental development of the FP
	Spatial planning system	strategic planning tools from the regional government under drafting process	strong regulatory power of the planning tools
		PUA lands have special regard in planning policies; "huertas"	PUA lands are not a particularity; falls into multiple land classes
AL		City of Valencia + 44 municipalities	Capital Region + 6 municipalities
TUR	(Metropolitan)	call for political will	call for political flexibility
STRUC	territorial governance	supra-municipal model	integrated multi-level framework
	Urban expansion trend	liberalized urban growth	regulated urban growth
SPATIAL	Urban expansion trend cover change	liberalized urban growth significant change in the urban land cover; urban sprawl evident	regulated urban growth significant change in the non-urban land cover surrounding the urban core; sporadic urban growths in the periphery
SPATIAL	Urban expansion trend cover change	liberalized urban growth significant change in the urban land cover; urban sprawl evident	regulated urban growth significant change in the non-urban land cover surrounding the urban core; sporadic urban growths in the periphery
SPATIAL	Urban expansion trend cover change	liberalized urban growth significant change in the urban land cover; urban sprawl evident land abandonment, land fragmentation	regulated urban growth significant change in the non-urban land cover surrounding the urban core; sporadic urban growths in the periphery green area preservation
SPATIAL	Urban expansion trend cover change	liberalized urban growth significant change in the urban land cover; urban sprawl evident land abandonment, land fragmentation small farmlands swallowed by urban encroachment; young farmers encouraged to participate	regulated urban growth significant change in the non-urban land cover surrounding the urban core; sporadic urban growths in the periphery green area preservation large farmlands eating up the small ones; difficult for young farmers to join in
MIC	Urban expansion trend Land cover change State of PUA Multifunctional agriculture	liberalized urban growth significant change in the urban land cover; urban sprawl evident land abandonment, land fragmentation small farmlands swallowed by urban encroachment; young farmers encouraged to participate environmental consideration; diversification; cultural landscape preservation	regulated urban growth         significant change in the non-urban land cover surrounding the urban core; sporadic urban growths in the periphery         green area preservation         large farmlands eating up the small ones; difficult for young farmers to join in         environmental       consideration; diversification;         provision of green recreational spaces
ECONOMIC	Urban expansion trend Land cover change State of PUA Multifunctional agriculture Social movements	liberalized urban growth significant change in the urban land cover; urban sprawl evident land abandonment, land fragmentation small farmlands swallowed by urban encroachment; young farmers encouraged to participate environmental consideration; diversification; cultural landscape preservation political voice being fought hard; focus on territory & food system	regulated urban growth   significant change in the non-urban land cover surrounding the urban core; sporadic urban growths in the periphery   green area preservation   green area preservation   large farmlands eating up the small ones; difficult for young farmers to join in   environmental consideration; provision of green recreational spaces   strong political voice; focus on food system

	investing in local food system started four	long history of robust local food systems	
	years ago	with national support	
Relationship of PUA actors	conventional vs agroecological farmers	conventional farmers also agroecological farmers	
	organic farmers still a small portion of aggregate production	agroecological farmers taking over mainstream production	

# CHAPTER 7

# Conclusions

This chapter presents the summary of findings of the present research, the conclusions as valid derivatives of the findings, the implications of the findings, and some recommendations for future directions in the field of spatial planning studies, PUA, and urban-rural partnerships.

# Summary of Findings

This study was conducted for the purpose of revealing the extent to which PUA has taken on a post-productive transition through innovation and adaptation strategies, and the ways in which spatial transformations can contribute to the said transition.

To achieve these objectives, the state of multifunctional agriculture (MA) – the fundamental component of postproductive paradigm (or transition)—and its indicators and subcomponents, were explored in each case study.

# Valencia: Territorial Defense Mode On!

For the case of Valencia, PUA is deeply embedded in the cultural and historical landscape of the city. The PU lands are primarily *huertas*, the traditional irrigated and cultivated lands surrounding the city. Valencia is an exceptional example of this kind of cityscape: an urban landscape locked in by historical lands from centuries of traditional agriculture. However, this kind of configuration also comes with its downsides, such as the severe territorial tension between the huertas needing preservation and the city requiring more lands to accommodate its growth.

In this case, Valencia's post-productive transition is not limited to agriculture as a mere local traditional industry, but also recognizes the territorial policies and the broader governance systems in place as valid indications of the transition. More than anything, the patrimonial territoriality of the huerta is at the heart of the innovation and adaptation strategies found in its PUA. To an extent, this could be attributed to the liberalized urban policies of the city and the lack of a solid metropolitan development model (and governing body) that could push for a strategic, comprehensive, and sustainable urban-regional development.

The salient feature of Valencia's MA is the formation of social movements that push for l'Horta territorial protection and cultural preservation. The agroecological transition aspect is seen to still be in its infancy, not gained institutional attention until around four years ago, despite the strong incidence of diversified production, social farming, and a long tradition of short good supply chain in its PUA production. The agroecological trend and sustainable food system initiatives in VMA are a promising endeavor, and still has a long way to go.

In sum the Valencian trajectory of post-productive PUA is a combination of territorial struggle and agroecological transition.

# Copenhagen: On to the Greener Pastures!

The Copenhagen case demonstrates a type of PUA and MA on the other side of the spectrum. The main preoccupation of PP in this case is not the territory (with almost 80% share of agricultural land mass), but the actual green transition in the agricultural production and consumption, and further provision of green spaces for natural and recreational purposes. With robust spatial planning policies and strong land use regulation at all governance levels, there is strong allocation for urban and non-urban lands, regardless if an agricultural land falls into an *urbanizable* use in the future. This implies that Danish agricultural lands are either highly conserved or expected to be converted in the future. Additionally, with the decisive position of local municipalities in land-use planning and spatial development, the fate of the agricultural lands in GCA are subject to precarious conditions, be that a good thing or otherwise.

The general farming activities present in the Danish context show resilience to urbanization to a significant degree, and the incorporation of environmental issues to the development of agriculture is an arguably strong indication that its agricultural trajectory has shifted already.

With territorial issues out of the way, the PU multifunctional and innovative agriculture in GCA is characterized by intensified campaign to being green – organic production, nature conservation, biodiversity creation. More than the policy frameworks that call for ecologically-sound agricultural production, an important component of the Danish PUA is the strong influence of citizens, both consumers and producers, in creating a future-proof and sustainable food system for the city and its periphery.

As it is hard for young farmers to participate in conventional farming because land prices are too expensive; most have resorted to urban gardening, diversified cropping system, and small-scale production in PU areas, further strengthening the post-productive trajectory of the Danish case.

The Copenhagen case thus presents a post-productive example from the greener pastures – a transition that is also aligned with the broader sustainable development goals of the city.

# Conclusions

The main themes of this study revolve around transformations when answering the RQs – changes in the PU land (spatial), changes in the agricultural practices in the PU (socio-economic), and the changes in planning and agricultural policies (structural) – all of them part of the broader post-productivism in agricultural societies.

#### • How has the PU agricultural land coverage transformed over the years?

The Mediterranean PUA of Valencia is a highly dynamic and tumultuous scene. With rapid urban sprawl over the years, the PU is the most susceptible, and thus put in the center of political issues in the metropolitan area. The conversion of the huertas to urban uses, land fragmentation, and land abandonment have rendered the PU of Valencia a highly contested area, and political will is needed if an integrated, comprehensive, and socially-just metropolitan development is to be aimed for.

The Nordic case of Greater Copenhagen, on the other hand, presents a regulated urban expansion, due to strong adherence to spatial planning rules and zoning laws, particularly the Finger Plan. Having this rigid spatial planning framework, conversion of agricultural lands into other uses by urban expansion is not easily achieved, and thus not the most salient issue in the area. The sporadic urban development outside the city were planned according to the land uses, including the conversion of agricultural lands to other uses.

# • How do the local PU farming actors innovate and adapt to the changing PU landscape, growing environmental concerns in agriculture, and the evolving (urban) consumer demands?

The PUA scene in Valencia is characterized by innovations and adaptation strategies that respond to the loss of agricultural lands and structural changes. With the agroecological transition in place, diversified crop production, social farming, and short food supply are practiced by the agro-producers. The multifunctionality of PUA in Valencia also shows that farming is highly tied to the formation of social movements and farmer collectives, and these assemblies see territorial protection of the huertas equally important in pushing for sustainable food systems, food sovereignty, and balanced urban-rural development in the city. This two-pronged innovation and adaptation strategies in the Valencian case reveals a dual trajectory of post-productivism in the area: a new agroecological transition on the one hand, and an old struggle to maintain and protect its historical PU space on the other.

The Copenhagen PUA scene features a very close connection of conventional and organic farming, having diversified production, high-value crops, and strong organic farming tradition. Along with the policy frameworks that call for ecologically-sound agricultural production, a more important component of the Danish PU agriculture is the strong influence of citizens, both consumers and producers, in creating a future-proof and sustainable food system. Thus, with strong planning tradition and efficient agricultural policies, the innovation and adaptation strategies of the farmers towards an ecologically-sound, inclusive agriculture are not necessarily intended at optimized production yield, but with more value-added product and services. These render the state of post-productivism in the Copenhagen case with a different thematic focus; with territorial and structural issues aside, it strives for a comprehensive green transition in agriculture.

The two cases show that post-productivism in different European regions manifest in different ways, with different transitional trajectories, because it is a phenomenon that is deeply embedded in the historical, geographical, and political particularities of each region.

# Implications

The implications of this study further contribute to the growing literature of PU studies, MA, and urban and regional development. The innovation and adaptation strategies serve as the interface to bridge the three facets of PUA: physical landscape, political climate, and agricultural shift to sustainable systems.

The study employs an integrated perspective in studying urban development policies and their effects on the peripheries. By looking at the underlying policies and the actual agricultural practices, a broader understanding of comprehensive territorial policy frameworks as key to sustainable urban-rural partnerships can be construed.

Additionally, this study creates room to explore the potentials of citizen movements and local initiatives in the governance of metropolitan regions, by defining the link between social innovation and territorial development.

Having two different case study areas in the study of the PU brings forward the geographical and sociopolitical particularities of different European regions. This implies that the integrated policy framework for territorial planning and agriculture at a pan-European level can be improved to support both diversified and specific approaches and regionally-tailored interventions.

# Recommendations

Based on the findings and conclusions drawn from the present study, the following recommendations are presented:

- 1) The study of PUA innovation and adaptation strategies can be replicated in other European regions to elucidate on the nuances of city governance and urban-rural partnerships in the EU.
- 2) The undertaken PP approach can be extended to become a potential research agenda in developing countries as well and examine the distinctive patterns and features that may emerge.
- 3) Deeper investigation of specific PUA actors can be taken as a whole new case study, in order to have a more detailed account of their mechanisms for community development.
- 4) For methodology, a more detailed quantitative approach in analyzing spatial transformations can be done to support the multifunctional agricultural transformations in PU communities.
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# Appendices

## Appendix A. CORINE Land Cover Redefined Classification System

PART 1: CORINE Land Cover (CLC) Nomenclature

Synthesis of CORINE CLC illustrated guide from:

https://land.copernicus.eu/user-corner/technical-library/copy\_of\_Nomenclature.pdf

Standard Guide to Land Classifications of CORINE Land Cov	/er
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Level 1	Level 2	Level 3
1 Artificial surfaces	11 Urban fabric	111 Continuous urban fabric
		112 Discontinuous urban fabric
	12 Industrial, commercial	121 Industrial or commercial units
	and transport units	122 Road and rail networks and associated land
		123 Port areas
		124 Airports
	13 Mine, dump and construction sites	131 Mineral extraction sites
		132 Dump sites
		133 Construction sites
	14 Artificial, non-agricultural	141 Green urban areas
	vegetated areas	142 Sport and leisure facilities
2 Agricultural	21 Arable land	211 Non-irrigated arable land
areas		212 Permanently irrigated land
		213 Rice fields
	22 Permanent crops	221 Vineyards
		222 Fruit trees and berry plantations
		223 Olive groves
	23 Pastures	231 Pastures
	24 Heterogeneous	241 Annual crops associated with permanent crops
	agricultural areas	242 Complex cultivation patterns
		243 Land principally occupied by agriculture, with significant areas of natural vegetation
		244 Agro-forestry areas
3 Forest and	31 Forests	311 Broad-leaved forest
semi natural		312 Coniferous forest
areas		313 Mixed forest
	32 Scrub and/or herbaceous	321 Natural grasslands
	vegetation associations	322 Moors and heathland
		323 Sclerophyllous vegetation
		324 Transitional woodland-shrub
	33 Open spaces with little or	331 Beaches, dunes, sands
	no vegetation	332 Bare rocks
		333 Sparsely vegetated areas
		334 Burnt areas
		335 Glaciers and perpetual snow
4 Wetlands	41 Inland wetlands	411 Inland marshes
		412 Peat bogs
	42 Maritime wetlands	421 Salt marshes
		422 Salines
		423 Intertidal flats
5 Water bodies	51 Inland waters	511 Water courses
		512 Water bodies
	52 Marine waters	521 Coastal lagoons
		522 Estuaries
		523 Sea and ocean

Source: http://www.igeo.pt/gdr/pdf/CLC2006\_nomenclature\_addendum.pdf

PART 2: CLC in the cases of Valencia and Copenhagen Delineating the URBAN and NON-URBAN land covers based on CLC

Step 1. Deriving from the CLC nomenclature, the 5 major groups are simplified into the "urban" and "non-urban fabric" categories for efficiency of area boundary delineation.

5 major groups

- (1) Artificial surfaces URBAN
- (2) Agricultural areas

ORDAN

- (3) Forests and semi-natural areas NON-URBAN
- (4) Wetlands
- (5) Water bodies

Thus, the URBAN category in this research consists of Group 1 in CLC (artificial surfaces), while Groups 2 to 5 (agricultural areas, forests, wetlands, and water bodies) are simplified to NON-URBAN category.

Step 2. One particularity should be noted in the URBAN category, where class 1.2.1 (industrial or commercial units) has a sub-category called Agricultural Farms, which is then duly considered in the present study.

According to CLC (p. 13), this sub-category includes:

- buildings, in-door spaces and yards for keeping farm animals
- garages, workshops, production buildings, lay-by areas for agricultural machinery
- paved and unpaved storing areas and warehouses
- bad land with ruderal vegetation

The description (CLC Nomenclature Guide, p. 13) is as follows:

"...The farms are often located in outskirts or close to rural settlements with agricultural function. Concentration of agricultural buildings in areas of various sizes was associated with collectivisation of agriculture. The quoted areas smaller than 25 ha are included in class 112 (discontinuous urban fabric)."

Based on this definition, this special particularity of the URBAN category will be considered part of the 'peri-urban agriculture lands' in the present study. The main challenge for the researcher now is the careful outlining of class 121's non-agricultural use against this agricultural use.

Step 3. After the careful delineation of the agricultural and non-agricultural uses in the outskirts of the urban fabric, these identified periurban agricultural farms will then be integrated to the formal agricultural areas indicated in the NON-URBAN category (see Step 3).

This integration is done for a more detailed consideration of agricultural use of lands, going beyond the visual interpretations and generalizations of CLC.

Step 4. The research focuses on the agricultural lands surrounding the URBAN categories.

Within the NON-URBAN category, only the Class 2 - agricultural areas will be considered, as it is the primary focus of the present study. Since the whole Class 2 – agricultural areas are too broad for the spatial scoping of the study, the researcher will resort to the official territorial delineations of the metropolitan regions of Valencia and Greater Copenhagen, taking into account the land coverage of the different municipalities having agricultural economic base in them.

5 major groups:

- 1) Artificial surfaces (URBAN) → Agricultural farms in the urban outskirts (Zone A)
- 2) Agricultural areas (NON-URBAN) → Agricultural lands within the metropolitan vicinity (Zone B)

- 3) Forests and semi-natural areas (NON-URBAN)
- 4) Wetlands (NON-URBAN)
- 5) Water bodies (NON-URBAN)
- Step 5. This step involves the integration of the identified zones A and B in QGIS, and the resulting land coverage will serve as the periurban agricultural land in the present study.

To answer RQ 1:

#### RQ 1: How has the PU agricultural land coverage transformed over the years?

it is important to see the change from urban to non-urban land cover over the years. By taking the above-mentioned steps, the peri-urban agricultural areas are already delineated. The change over time will be done by utilizing the land cover data provided by CLC for the years 1990 and 2018, and by identifying the current specific industrial infrastructures that splinter the peri-urban landscape.

Step 6. This step is a thematic content analysis to correlate the current spatial planning system that affects these changes over the years.

### Appendix B. Semi-structured Interview Guide

### Valencia

### Interview Guide

General Coverage: Understanding the current positionality and relevance of \_\_\_\_\_ in the peri-urban agriculture in Valencia

### Questions and Probes:

- 1. How did \_\_\_\_\_ come into being?
  - Main principles, objectives, lines of action
  - o Local institutional setting and political precursors
- 2. How does the cooperative view agrocecology and food sovereignty?
  - o State of agriculture in Valencia
  - Current projects/initiatives/campaigns
- 3. Can you give me a walkthrough of \_\_\_\_\_ food supply chain?
  - Scale of local production
  - Target consumers
  - o Connectivity to urban consumers
- 4. What is the role of the \_\_\_\_\_ in upholding the territoriality of the Valencian huertas?
  - Current challenges and/or issues related to the territory, planning policies, and landscape change in the area
  - Specific communities and/or land parcels covered or addressed
  - Current projects/initiatives/campaigns that address the territorial issues
- 5. How embedded is the \_\_\_\_\_ in the local farming population?
  - o Membership and inclusion process
  - o Community participation
  - Publicity channels
- 6. How does the \_\_\_\_\_ see the future of the Valencian huertas?

### Copenhagen

Questions and Probes:

- 1. Farm introduction
  - Historical background of the family farm
  - How would you describe your farm? What sets it apart from others?
- 2. Innovation and adaptation strategies over time
  - Technological innovations? Cropping/planting system?

- Employment within the farm
- 3. Conventional farming and its supply chain
  - Modern farm based on plant breeding: What are the crops you are growing here?
  - How is your use of pesticides and fertilizers here?
  - Do you export? If so, where and which kind of produce?
  - Target consumers: local population? Urban consumers? Presence in major supermarkets?
- 4. Organic farming and its supply chain
  - Hovholm Organic Agriculture: when did this start?
  - A professional challenge for the farm... but also an opportunity for sales, higher prices, better expansion opportunities
    - how did it pose a professional challenge for your farm, and how did you overcome it?
  - What percentage of your output is attributed to organic farming? Do you plan to expand it?
  - What are your major consumer groups? local community, urban population, supermarket chains?
  - Do you export?
- 5. Diversified income generation
  - "versatile" business looking to move forward what do you mean?
  - Road salting services, installation of golf courses? how does this work in your business model?
  - What non-agricultural activities are present in your farm estate?
  - When did you start diversifying your income from the farmland?
- 6. Land-use and ownership
  - How big is your whole estate? How is it divided into different land uses? (conventional farming vs organic farming; golf courses; road salting services, other branches)
  - What is the current situation of agricultural land use in your 900-hectare of arable land?
  - Is there any pressing issue about urban expansion and rapid urbanization in terms of your estate's coverage?
  - Current challenges and/or issues related to the territory, planning policies, and landscape change in the area
- 7. Employers' Union membership
  - Can you tell me about this GLS-A and how it works in the kind of enterprise you have?
- 8. Farm succession and the green future for Denmark
  - How does the farm see itself in the context of Danish green transition?
  - Future of the farm in the ecological transition would you give up conventional farming?