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Review

Preserving Farmland on the Urban Fringe: A Literature Review on Land Policies in Developed Countries

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Abstract: This paper reviews the recent literature dealing with farmland protection (FP) policies in developed countries from a planning perspective, with a specific focus on the Mediterranean region. It provides coverage of French language papers that may have been omitted in previous reviews. While the Mediterranean is often pointed out as a region with acute challenges related to food security and a lack of effective planning policies, the literature underlines that issues related to FP policies are similar across the world. Hence, this review may bring valuable insights for more sustainable management of farmland on the urban fringe. It maps several interesting areas of research concerning the often implicit and disparate rationales of FP policies as well as the barriers and potential avenues for improvement for FP. It highlights that FP cannot rely merely on transferring policy tools that have proven successful elsewhere. It also reveals that land policies do not always take into account the specific needs of farming systems, as they often focus on land rather than on agriculture. Further research is thus needed to reveal the interaction over time between the use of certain FP tools and the unique local features of urban fringe agriculture. This review may be of interest to students and scholars, but also to practitioners, policy makers and local groups looking for innovative, more flexible or locally suited farmland protection programs.

Keywords: farmland protection; peri-urban agriculture; land-use planning

1. Introduction

Farmland preservation is a longstanding challenge on the urban fringe [1,2]. In the last two decades, farmland loss has increasingly become a worldwide matter of concern, both for environmental and food security reasons [3]. In all developed countries, as well as in some developing and emerging countries, there is debate about how farmland conversion to urban uses should be governed [4].

Extensive scientific literature is devoted to the issue of farmland preservation on the urban fringe, which involves planners, agricultural economists, geographers, and other social scientists. Scholars have provided a good overview of the range of land policy instruments tested around the world. The tool box features land-use regulation, acquisition (or transfer) of land or development rights, and incentive-based approaches [5]. Law scholars have shown that their preferential use varies according to the country [6]. Depending on local property rights and land-use regulations, the same tool (e.g., zoning) may be used for different planning practices in the United States and Europe [7].

In this paper, it is not our objective to describe and assess farmland protection (FP) techniques, as some scholars have already provided comparative evaluations [8]. Our focus on planning literature

aims to draw lessons from policy alternatives and local initiatives with regard to the way they take farming into account by answering the following questions: what are the rationales for FP? What are the main barriers and challenges hampering FP programs' efficacy and the inclusion of farming issues in land policies? Can we point towards future policy directions or research avenues? How could FP policies better maintain farming while meeting public preferences on the urban fringe?

Our methodological approach consists of a review of scientific papers published in English and French on FP in the face of urbanization, with a particular focus on the Mediterranean region. While such a topic is multidisciplinary by nature, we concentrate on qualitative studies conducted in planning, geography, sociology and political science. Our review cites a few key economics references, but does not cover the extensive existing literature on this topic in agricultural and land-use economics. While farmland preservation has recently become a major issue in emerging countries, especially in China [9,10], we consider that the issue of FP in such countries would deserve separate reviews in order to take into account their specific property regimes and land-use regulations. Hence, we narrowed our literature review to developed countries and to the Mediterranean region, thanks to our access to the French-language literature and with a view to this paper's inclusion in the special issue of the *Land* journal on "Land and Farming System Dynamics on the Mediterranean Basin: From Global to Local Case Studies".

Farmland preservation is particularly urgent in the Mediterranean; we identified research on this topic in all European countries in the region, as well as in the Maghreb, Lebanon and in Israel. In the last two decades, the Mediterranean has undergone an intense urbanization process, mainly at the expense of prime agricultural land, since cities are historically located in the most fertile coastal plains [11] and tourist activities have increased urban sprawl on the coasts [12,13]. Land tenure varies across regions. Around cities, it may be very fragmented amongst private smallholders or owned by a few large landowners that are public, religious (*habous* or *waqf* lands) or private [14–16]. Mediterranean farming systems are under particular pressure from climate change and soil degradation, increasing the challenges related to food and water security [17]. Farming is also jeopardized by the risk of land abandonment, which stems from the rural exodus as well as from the pressure to convert farmland for urban uses in peri-urban areas [18,19]. In this context, Mediterranean peri-urban agro-ecosystems show contrasting dynamics, ranging from decline to adaptation to urban demands [20,21]. Diversification activities, both agricultural (social farming, educational farms) and non-agricultural (tourism, energy), as well as the supply of services to the cities, are increasing on peri-urban farms, at least in Northern Mediterranean countries. They facilitate the integration of agricultural producers into short supply chains. However, while they appear in some cases as a rewarding strategy and a successful response to urban pressure, in other cases they can seem a "last attempt" to adapt before abandonment [19]. Such diversification activities often raise a need for specific building rights to implement the multiple 'farm to fork' steps requiring more than the usual farm buildings for storage of products or machines and shelter for animals. For example, farmers seeking better integration into local supply chains may claim building rights related to on-farm processing and conditioning of products, distribution hubs and on-farm shops or accommodation for agri-tourism. In peri-urban areas, planning authorities thus have to arbitrate between different interests, finding innovative ways to preserve farmland from further urban sprawl, while considering claims for the right to build structures needed for multifunctional farming projects [12,15]. This brings into question the efficacy of local policies dedicated to FP on the urban fringe [22].

The results of this literature review on developed countries are presented in three sections: we first give insights into the rationales for FP, then into the barriers to FP and finally into the avenues of improvement for public policy and future research. Before proceeding, we detail our material and methods.

2. Materials and Methods

This literature review covers 104 papers from 22 journals. This corpus was built on a combination of two methods.

First, we searched the SCOPUS and WOS databases for all papers dealing with farmland preservation/protection in the face of urbanization. The words “protection” and “preservation” are both relevant. “Preservation” is more frequent where tools are incentive-based, while “protection” is used where the approach is regulatory. However, some papers use these terms interchangeably, sometimes even employing the term “conservation”. We thus used the keywords “protection”, “conservation”, and “preservation” in association with “farmland” and “urban”¹. Taking into account that some papers were identified both in WOS and SCOPUS, this query resulted in a corpus of 200 unique references from 89 scientific journals, 60 of which contained only one reference. China (with 88 papers) and the United States (with 64 papers) stood out as the prime areas studied. This corpus omitted some papers that we considered important and counted only 12 papers on the Mediterranean region.

Second, we conducted a manual search of 30 journals: the 7 English-speaking journals with more than 5 references in this WOS-SCOPUS corpus² and 23 other journals (15 in French³ and 8 in English⁴) from the field of geography and planning. We scanned all issues of these journals since 1995, reading the titles, keywords and some abstracts, and added 141 relevant papers to our corpus (Figure 1).

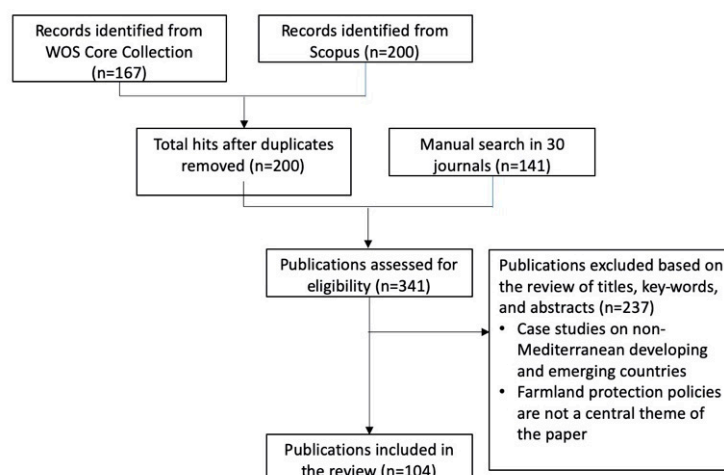


Figure 1. Flow diagram of the selection process.

¹ In the SCOPUS database, we found 200 references through the query: (TITLE-ABS-KEY (“farmland preservation” OR “preservation of farmland” OR “farmland conservation” OR “conservation of farmland” OR “farmland protection” OR “protection of farmland”) AND TITLE-ABS-KEY (*urban*)) AND SUBJAREA (mult OR agri OR bioc OR immu OR neur OR phar OR mult OR arts OR busi OR deci OR econ OR psyc OR soci). In the WOS database, we found in May 2020 167 references through the query: (TS = (“Farmland preservation” or “preservation of farmland”) AND TS = (*urban*)) OR (TS = (“farmland protection” or “protection of farmland”) AND TS = (*urban*)) OR (TS = (“farmland conservation” or “conservation of farmland”) AND TS = (*urban*))). Indexes = SCI-EXPANDED, SSCI Timespan = All years.

² The journals with 5 papers or more in the WOS-SCOPUS query were *Land Use Policy* (32 papers), *Transactions of the Chinese Society of Agricultural Engineering* (19 papers in Chinese, not included in our analysis), *Sustainability* (19), *Journal of Soil and Water Conservation* (12), *Journal of the American Planning Association* (7), *Landscape and Urban Planning* (7), *Habitat International* (7), and *Journal of Rural Studies* (5).

³ The selection of French journals was based on their ranking by the French High Council for the Evaluation of Research and Higher Education (HCERES) and their interest in the Mediterranean region: *Economie rurale*, *Revue d’économie régionale et urbaine*, *Noréis*, *Géocarrefour*, *Développement durable et territoire*, *Méditerranée*, *Espaces et sociétés*, *VertigO—la revue électronique en sciences de l’environnement*, *Sud-Ouest européen*, *Annales de géographie*, *Géographie*, *économie et société*, *Etudes Rurales*, *L’Espace géographique*, *Options Méditerranéennes*, and *Cahiers Agriculture*.

⁴ *Journal of Planning Literature*, *Agriculture and Human Values*, *Urban Studies*, *Environment and Planning C: Government and Policy*, *Environment and Planning D: Society and Space*, *Geoforum*, *Journal of Urban Planning and Development* and *Geographical Research*.

From this corpus of 341 papers, we excluded those on non-Mediterranean developing and emerging countries and those presenting only spatial analyses of farmland conversion without considering farmland protection mechanisms. We looked specifically for papers on the Mediterranean region and on public policies. We sorted the remaining papers into a mind-map diagram according to their focus on the following topics: the rationales for FP policies, the diversity of tools and stakeholders in farmland preservation policies, the importance of spatial, social and political contexts for understanding farmland preservation mechanisms and the impacts of FP. Figure 2 provides an overview of the categories and sub-categories identified through this review of titles, key-words and abstracts, in a mind-map diagram.

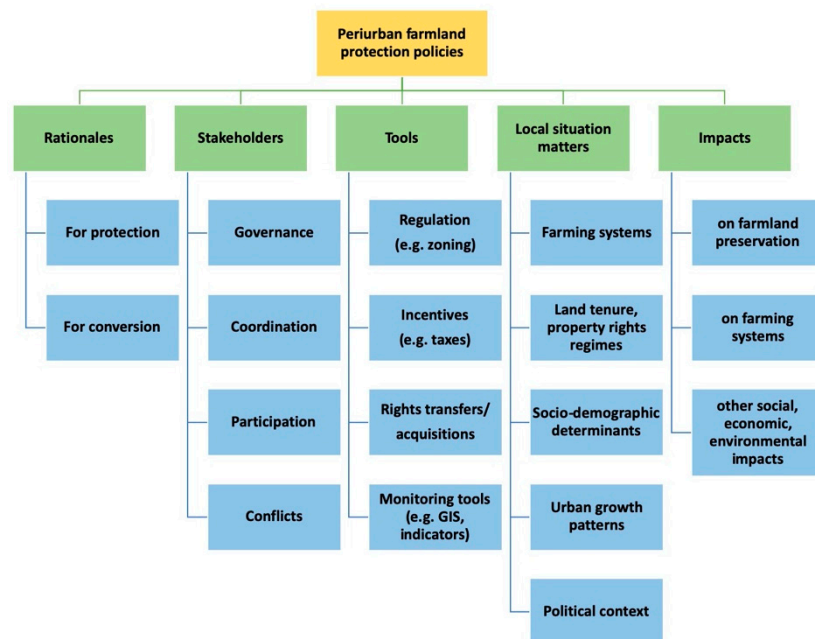


Figure 2. Mind-map diagram of the topics identified through the review of titles, key-words and abstracts.

Based on these two corpora built on a query in WOS-SCOPUS and a manual search, as well as on this mind-map diagram, we selected 104 papers to read. The main journal is *Land Use Policy*, with 45 papers, followed by *Landscape and Urban Planning*, with 18 papers. The remaining 41 papers are distributed among 20 journals, 12 in French and 8 in English. To proceed with reading and comparative analysis of the papers, we developed a standardized form to be filled with the main information we would collect from the papers, namely: the scale of analysis, the location of the case study, the FP instruments, the main actors, the factors for the success or failure of FP, the field or discipline, the research question(s) and method(s), and the avenues for future research. The results of this literature review shed light on the rationales behind FP, on the barriers to effective FP and on avenues of improvement for research and public policies.

3. Differing Rationales for Farmland Protection: Maintaining Farming is Not Always the Priority

Farmland preservation is often presented as an unquestionable necessity. However, since the 1970s, research has raised the questions as to why and for whom farmland should be preserved, uncovering diverse rationales [23]. Today, there is still no consensus about why farmland preservation is important.

3.1. Implicit, Changing, or Disparate Rationales for Farmland Protection

FP objectives are often not explicit [24]. The ambiguity lies primarily in policy framing. Agriculture itself may be overlooked or neglected because there are other overarching priorities: on one hand, social housing and employment issues may legitimize urban development, for instance in the Maghreb [20]

and Israel [25] and, on the other hand, environment or landscape preservation, rather than agriculture, may legitimize urban containment and open space protection in public preferences [26–28]. In triangular planning models that do oppose agriculture, nature and urban development [29], “nature and agriculture often stand in opposition in the quest for land” [30]. FP may also be conceived as an interim stage before projected urban development, as mentioned in Japan [31] or Israel [32].

Where FP is an explicit long-term priority, the rationales that legitimize such policies vary. Objectives for a given farmland or open-space preservation program may change over time and space [33]. For example, Amati and Yokohari [34] observe that contiguous municipalities assign different functions to the London Green Belt. Feitelson [35] illustrates the shifting rationales of the FP program in Israel since the 1960s: the program has moved from productionist arguments (farmland as a resource for food or as an economic sector) to an urban-centered perspective (farmland preservation as a growth management tool to regulate urban sprawl) and environmentalist arguments (concerns over loss of positive externalities). By 1977, Gardner [23], albeit skeptical about removing land allocation from market mechanisms, had already outlined four potential benefits that could reinforce the public legitimacy of FP policies: food security, economic benefits derived from a viable agricultural industry, open space and environmental amenities, and sounder urban development.

While there is no evidence that such varying or combined rationales hinder FP programs’ efficacy, scholars have underlined the heterogeneous nature of the stakeholders who support FP. In Canada, Spaling and Wood [36] identify disparate ethical views about FP and “anomalous alliances among interest groups with seemingly different land policy objectives”. Similarly, Bunce [37] examines the public discourse of the North American FP movement and the ideologies underpinning it over a 30 year period. He shows how the policy agenda has largely been controlled by non-farming interests, influenced by environmentalist and agrarian ideologies with alternating visions of farming for food production, ecological conservation, or rural authenticity. In the case of Israel too, “the rationales are used to cobble a coalition of planners, environmentalists, farmers, urbanites and exurbanites, against a powerful development coalition” [35].

So whom, in the end, is farmland being preserved for? In some programs, farmers formed the original political support behind FP and were included in the process of elaboration [2]. In the state of Oregon, some farmers still support the programs, while others count among the landowners bristling for change and claiming compensation for the foregone increases in land prices in the 2000s [38]. In other programs, residents’ quality of life is the main driver and public focus is on farmland, rather than on farming. In such cases, scholars warn that “without expanding its focus beyond farmland to encompass farming and farmers, the movement risks losing both integrity and effectiveness” [39]. Farmers may be cast in the role of guarantors of food supply and stewards of landscape, rural heritage and community values [40].

Such combined rationales appear in Mediterranean countries and elsewhere. From a critical perspective, research on FP rationales reveals who defines and controls the FP agenda and whose interests it really serves. It clarifies why FP remains a contentious policy issue.

3.2. *Farmland Protection as a Contentious Policy Issue*

On the urban fringe, many conflicts are related to FP. Since the 1970s, scholars have highlighted equity implications of FP instruments [23,41–43]. Conflicts first place in opposition local authorities implementing the FP policies and landowners wishing to lock in the land value increase [44]. Conflicts are also linked to place-based collective efforts to prevent the negative impacts of urbanization on agrarian landscapes. In such cases, FP often appears to be “window dressing” for other goals [39] that are not directly linked to agricultural interests. In the Greater Paris Region (France), urbanization projects are contested mainly by opponents of farmland conversion. Some residents seem more concerned about illegal occupations of fallow land (especially by gypsy communities) than about the abandonment of farming itself [45]. In Swiss villages, residents protest against dense urban developments by denouncing the visual nuisance and the loss of landscape [46]. Similarly, Pacione [47]

points out that fear of increasing road traffic is the overwhelming argument put forward by residents in the public consultation proceedings for the preservation of the Glasgow greenbelt. Hence, protection of local amenities is a key argument when residents and associations get involved in FP movements.

In the Mediterranean, land-use conflicts over farmland are increased by the scarcity of the resource, as farming is often in intense competition with both residential and touristic uses. The Huerta de Valencia is a good example of such a situation, as its peri-urban agricultural systems are also valuable as an important cultural, natural and landscape heritage [48]. On the French island of Corsica as well, many conflicts arose over the implementation of land-use restrictions on the coast [49].

3.3. *Taking Differing Rationales into Account in Policy Design*

Research on rationales for FP has practical policy implications. Revealing that heterogeneous coalitions of stakeholders and disparate farmland ethics are involved in land issues on the urban fringe may suggest policy options and decision-making tools that reduce land-use conflicts [36]. Place attachment is often identified as a strong motivation for FP [28,50]. In addition, peri-urban agricultural landscapes are valued by the urban public for a range of functions not typically included in land-use policies [51,52]. This knowledge can assist policy makers in prioritizing which areas to preserve. Using focus groups and surveys of residents to identify public preference, Kline and Wichelns [53] show that FP programs should consider not only farmland or farming (or prime farmland) but also the farming style (e.g., environmentally friendly farming). In comparing the mission statements of 130 land trusts engaged in FP, Brinkley [54] similarly finds “uniform preferences for parcels that provide ecosystemic services, wildlife habitat, viewsheds, local heritage, and agricultural productivity”. Kerselaers et al. [55] provide a review of the diversity of criteria that are mentioned to determine farmland preservation priorities. In the case of the Huerta de Valencia, Marques-Perez and Segura [48] stress that integrating people in the decision-making process is fundamental for conveying the preferences of citizens and preventing conflicts.

The literature on rationales therefore highlights a public focus on open space, landscapes and the environment, beyond farming. Mixed policy goals and conflicting interests, both among stakeholders and among farmers themselves, are part of these underlying rationales. The confusion between farmland and farming may be the first barrier to the success of FP programs.

4. **Barriers and Challenges for Farmland Protection Programs to be Effective and Take Farming into Account**

FP programs’ implementation often encounters the same problems: the lack of awareness of how farms and farming systems operate; the lack of adequate enforcement by, and coordination between, public stakeholders; and the failure to take into account the contradictory time frames of the parties involved as well as the specific features of the local context.

4.1. *Lack of Awareness of How Peri-Urban Farms and Farming Systems Operate*

Preservation and commodity programs may work against one another on the suburban fringe [56].

Agricultural policies, driven in the US by the state and in the Mediterranean by national governments and the European Union (EU) use regulations and incentives to tell farmers what and how to farm. They may be decisive in maintaining farming (e.g., through income support or through direct payments to farmers) in contexts of high external pressure for non-agricultural use of the farmland. However, such policies do not always support peri-urban farms. For instance, Piore et al. [57] explain that the EU Common Agricultural Policy does not recognize the specific needs of urban and periurban agriculture due to their particular characteristics in terms of actors, scale, diversity and location in urban areas and their surroundings. Urban and peri-urban farms were even excluded from Rural Development Policies until very recently.

Similarly, FP programs sometimes show a lack of awareness of how farms and farming systems work, especially when they are designed by urban stakeholders without sufficient knowledge of

agriculture. Zoning may show spatial inconsistency. When prime productive farmlands are located close to urban areas and face higher pressure, they may be less protected, as in the South of France [58]. In Wisconsin, for instance, exclusive agricultural zoning is more likely to be adopted in municipalities located outside conurbations [59]. Moreover, when strict zoning regulations are imposed on some areas for urban containment (and not for farming purposes), they may increase urbanization pressure and the processes of land speculation in the surrounding farmlands where restrictions are less severe [29,60].

Issues of spatial coherence have also been pointed out in programs of purchase of development rights (PDR). Lynch and Musser [61] showed that preserved parcels were scattered in Maryland. Such programs involve significant tradeoffs between preserving the most productive land (for sustaining the agricultural economy) and annexing the land that is most strategic for growth management policies [62,63]. This is especially significant when priority purchase areas are designated by local governments and/or nonprofit organizations [64]. On the urban fringe, voluntary FP instruments are not always sufficient to preserve the critical mass of farmland needed to sustain an agricultural industry [65]. With regard to achieving this goal, [66] stress the need to consider both the erosion of the farmland base and parcel fragmentation (parcel size and contiguity), because isolated parcels are less likely to remain actively farmed. To justify their public cost, PDR programs still have to demonstrate that they “not only prevent development, but truly help maintain farming” [67].

4.2. Debates on the Impact of FP Programs on Farming on the Urban Fringe

The impact of FP programs on farming has been widely debated. In the 1970s and 1980s, the “impermanence syndrome” was highlighted amongst farmers on the rural/urban fringe, who were reluctant to invest in farming because they expected agricultural decline and urban development [68,69]. Scholars compared alternative tools of FP [42,70]. In the 1990s, scholars underlined the positive effect of FP programs on preserving farming activities. Cases showed that strict regulations help avoid farmland fragmentation [2], while PDR enhances farms’ economic viability by providing farmers with funds that can be invested in farm operations [71].

Since 2000, the effects of zoning and conservation easements on agricultural property values have been debated, but results of various econometric studies remain inconclusive [43,72]. Roe et al. [73] showed that preserved farmland provides an amenity for new residents that might attract new development in the surroundings. In their review, Bergstrom and Ready [74] conclude that public willingness to pay for farmland preservation in North America is positively related to farmland acreage, regional farmland scarcity, alternative development intensity, productivity (e.g., soil quality) and active farming, among others, and negatively related to intensive agriculture.

Several studies have examined how farming activity is affected by FP programs. Akimowicz et al. [75] highlight that Ontario’s Greenbelt zoning is not sufficient to preserve urban-influenced farming. Lynch and Musser [61] showed that FP programs were most effective in maximizing the number of acres and preserving productive farms, rather than in preserving contiguous farms or threatened farms. Whether preserved farmland is falling out of agricultural use is still debated. FP may lead to a change in the way people farm: some concerns have emerged regarding the diversion of preserved farmland from agriculture to less intensive uses. In Oregon, strict regulations “may inadvertently encourage the growth of hobby farming, potentially at the expense of commercial farming” [38]. Brabec and Smith [66] also note a rise in equestrian pursuits and wildflower meadows taking “land out of traditional agriculture” in areas preserved by conservation easements and clustering programs. However, Gottlieb et al. [76] posit that the negative effect of hobby farming on urban fringe agriculture may be exaggerated: they find no evidence that hobby farmers are disproportionately attracted by voluntary farmland preservation programs and no statistically significant impact from FP on farm investment. For Schilling et al. [77], preserved farmland is even more likely to remain actively farmed. It attracts young farmers and incites owners to have succession plans to transfer the land to an active farmer.

In the Mediterranean, both trends of abandonment and intensification have been observed in peri-urban farmland under land-use regulations. In the hills above Florence, Italy, restrictive zoning

aimed at preserving the historic landscape did not help retain farmers and active farming on the land [78]. Only wealthier landowners still maintain olive trees in their backyards, for aesthetic purposes. On the fringes of Barcelona, Spain, the Baix Llobregat Agricultural Park (BLAP) emerged as a farmers' initiative to preserve their farms and livelihoods [79]. This reinforced-zoning FP device was the impetus for sustainable intensification of existing farming and the development of local alternative food networks. Hence, though FP programs alone are often not enough to maintain active farming, they may be crucial to agricultural projects' success.

4.3. Implementation Challenges Related to Public Action: A Lack of Coordination

The scientific literature on FP reports many implementation issues related to the action of public stakeholders, especially for regulatory land-use planning.

Local authorities' interpretation of the legal framework often leads to spatial variations in the rules. This is mentioned in France [80], England [33], Switzerland [81] or the Netherlands [29]. Some authors further claim government failure. In Israel, Alfasi et al. [32] denounce case-by-case "discretionary-oriented decision-making, providing for revisions of the land-use plans and subsequently diminishing its efficacy", with FP being traded for economic growth. In Portugal, municipal master plans show high levels of non-compliance around Lisbon, mostly at the expense of peri-urban farmland [82]. In Italy, illegal building activities have been favored by the adoption of three building amnesty laws since 1984 [83]. But non-compliance with FP policies is not limited to the Mediterranean region [84]. In the US, Kline et al. [85] also document a "lack of adequate enforcement resulting in improper development mostly in exclusive agricultural use zones" in the Portland-Vancouver area. Since the 1980s, farmland preservation has often been analyzed as "a matter of local politics" [41,86], occasioning pressure on local officials by both development and conservation interests. Thus, it is not surprising that zoning decided at the local level appears to represent a political compromise [87].

To cope with implementation issues, planners and scholars stress the need for better vertical coordination between multiple decision levels [5,88]. Some authors fear negative effects on FP stemming from increased municipal autonomy [29] and believe that the solution lies in a supervisory authority [80,85]. However, Androkovich [24] shows that the supervisory commission which manages the agricultural land reserve of British Columbia, Canada, is also subject to pressure from development interests. The trade-off between restrictive top-down guidelines and local autonomy is still open to debate. In Mediterranean countries, the degree of local independence varies. Jouve and Napoléone [22] found that in 8 countries, local authorities (mainly at the municipal level) formulate their own land-use regulation policies and give building permits within the framework of national planning laws. The main tool used is exclusive agricultural zoning. In France and Italy, the current shift from a top-down management regime to a more decentralized and flexible one has, however, increased the complexity of governance [15]. Local authorities gain a lot of room to maneuver despite abiding by the common national legal framework. In Bavaria, Germany, Artmann [89] points out that flexibility—including informal planning strategies—sometimes acts as a guarantee of high acceptance and thus more effective implementation of FP policies by local authorities. Depending on the local context, local autonomy may thus attract criticism or praise for its potential to generate experimentation and innovation in FP.

Another implementation issue arises from the lack of horizontal coordination between sectoral policies. Farmland on the urban fringe is typically simultaneously at the heart of policies for urban planning, rural development, the environment and agriculture. The literature shows that a lack of intersectoral coordination increases low-density leapfrog urban development and the scattering of buildings related to farming. In Japan, the lack of coordination between the urban and the rural planning systems explains the disordered development patterns and increasing vacant areas in urban fringes [31]. In Switzerland, Gennaio et al. [81] identify conflicting goals and regulations with regard to farmland conservation and construction authorized for agricultural and rural development purposes in the Spatial Planning Law. Similar concerns about farm buildings are raised in other developed countries by Millward [90], Gosnell et al. [38] and Perrin et al. [15].

The Mediterranean is often pointed out as a region with a lack of enforcement of planning policies and a proliferation of illegal building practices. However, the above results underline that such issues occur in most countries.

4.4. Differences in Time Frames and Uncertainty Discourage Farming on the Urban Fringe

Conflicting time frames between long-term preservation programs and short-term individual strategies are additional barriers to maintaining active farming on the urban fringe.

A challenge of time frame adjustment is frequently mentioned for regulatory approaches. Uncertainty, speculation, and contradictory expectations are common within land-use planning processes [91]. Adelaja et al. [92] underline that the length of the planning horizon is directly related to the farm profile: farms with perennial crops, trees, or animals need longer-term planning horizons. In France, the economists Geniaux et al. [93] confirm that landowners' anticipation of agricultural land conversion is one of the key drivers of future development, especially when land-use plans are frequently altered or perceived as subject to change. Around Tokyo, where land prices are high, Yagi and Garrod [94] consider that a preferential taxation system may help farmers with real estate income to retain more of their farmland. Conflicting time frames between landowners' strategies, local authorities' political agenda and urgent urban development projects all create pressures leading to shorter farming leases. This in turn may discourage farming on the urban fringe and long-term farming investment.

Similarly, empirical studies dealing with negotiations on property rights (conservation easements, PDR) are united in stressing the issue of contradictory time frames among the parties and institutions involved. Because such programs are based on voluntary agreements, their efficacy may be weakened by individual landowners' strategies. Extensive literature has examined what motivates landowners to participate [95,96]. Lynch and Lovell [62] found that landowners closer to cities are less likely to participate, as did Comerford [97], who also stated that they are more likely to enroll for land that "they had already set aside for conservation, or land that is less suitable for production". Landowners may believe that placing an easement too soon could cause them to forego potential benefits in the future [98]. However, Towe et al. [99] found that the mere existence of an option to preserve farmland (through PDR) delays decisions to convert farmland for urban development.

4.5. Farmland Protection Policies Must Be Adapted to Local Contexts

The literature highlights the difficulty of assessing the efficacy of various tools and comparing case studies due to differences in social and spatial contexts. In particular, scholars warn against laying out possible causal relationships between land-use planning and land-use change [85]. Many exogenous and endogenous factors influence FP efficacy and land development patterns [100]. Our corpus of reviewed papers reveals three ranges of factors.

The first relates to geographic features such as existing population densities, urban growth patterns and physical land features, or socio-demographic determinants. For example, Altes [101] stresses that a tax on urban sprawl should distinguish between leapfrog and spill-over development patterns. Millward [90] finds more stringent control over urban sprawl in Great Britain and Japan than in Canada, yet puts his own results into perspective by stating that open space is a scarcer resource in the first two countries than in Canada. Previously around the Mediterranean, the typical urban settlement was very compact, with dynamic urban centers and numerous small and medium surrounding towns. But cities of the northern coast have all faced a sprawling expansion [102] while cities of the southern coast experienced more compact urban developments [14,103]. FP programs need to be adapted to such urban patterns.

The second range of factors relates to property rights regimes and land tenure. The right to compensation in the event of regulatory takings differs between countries [104,105]. Private property may be conceived as a bundle of rights or as full ownership. These differences help explain the growing interest in incentive- and market-based tools in the last twenty years in the US, while in Mediterranean countries, public policies

do not usually feature conservation easement programs for FP. Public acquisitions are possible in France, Algeria, Greece or Tunisia, but in full ownership [22]. Also, in most Mediterranean countries, taxes on land ownership are low as the property structure is based on family lands, which are often considered more as a heritage than a production factor. Moreover, on both shores of the Mediterranean, political reforms tend to promote the private appropriation of farmland [14] and reduce the scope of the commons, whereas collective forms of land management prove to be resilient, especially in the case of extensive agro-pastoral systems or in order to promote local food supply chains [106]. The local diversity of land tenure in the Mediterranean has to be considered in FP policies, as well as the absence of comprehensive cadasters and the frequent fragmentation of land holdings or uneven land ownership structure. In Greece, these factors still contribute to the scattering of buildings on farmland, despite the recent implementation of municipal land-use regulations [107]. Farmers' land tenancy also counts: in the south of France and in Italy, land speculation comes from landowners, while tenant farmers will more actively support strict zoning regulations on the urban fringe [78].

The third range of factors relates to the local nature and dynamics of farming systems. Agriculture characteristics—such as relative agricultural profitability, local agricultural organizations, and the image of the agricultural sector—have a significant impact on the adoption of local FP policies [108]. In the French Provence, for instance, organic farming with high profitability appears to be an ally in the preservation of farmland on the urban fringe (*ibid.*). The same argument could be applied to highly profitable peri-urban farming systems based on vegetables or quality grapes growing around many southern European cities. However, FP policies have to acknowledge the diversity—and complexity—of the dynamics of farms in Mediterranean peri-urban settings [109]; the prime farmlands and farmers' requirements in terms of water access, minimum farmland size and collective facilities are not the same for vegetable as for grape growing [78]. The economic and social organization of farming also influences the ability to resist conversion of peri-urban farmland and the adoption of regulatory FP policies, as illustrated by the impressive development of short food supply chains in the agricultural park (BLAP) of Barcelona [79] or by the way a local union of Provençal wine producers successfully defended its *terroir* against urban expansion [110].

Different tools or policies may be needed or prioritized according to the local context. All the cited former barriers to FP, whether related to insufficient awareness concerning farming systems, to inadequate implementation by local authorities, or to the contradictory time frames among stakeholders, confirm that FP cannot rely on merely copy-pasting policy tools that have proved successful elsewhere.

5. Improvement of Farmland Protection Policies and Future Research

Recently identified avenues of improvement should help in designing FP strategies that take local contexts into account. Such strategies include technical innovations in spatial modeling, innovative participatory and collaborative approaches, non-financial means of compensation and combined tools.

5.1. Integrating Social Data into Spatial Modeling

Since 1995, new methods in spatial modeling have been developed. They may be considered revolutionary tools for policy-makers and comparative research. They are usually based on remote sensing, multi-criteria analysis, and Geographic Information Systems (GIS). These approaches address methodological issues identified in previous comparative approaches based mostly on statistical indicators or local maps [100]. They have been used to develop international comparative approaches of land-use changes [102] and to integrate environmental and human variables in strategic farmland characterization maps [109,111].

Policy makers now count on such methods for diagnostic purposes in policy design to identify priority areas for intervention and context-specific public action opportunities [112], to assess FP policy implementation [38,63] with real-time monitoring [31], as well as to build prospective scenarios and sometimes to discuss trade-off options as part of participatory processes. Despite the

sophistication of landscape modeling, scholars today stress the need to integrate more social data into such approaches; for instance, public perceptions and attitudes [113] or stakeholders' values and community knowledge [51]. In the case of the Huerta de Valencia, Marques-Perez and Segura [48] tested one method based on multi-criteria analysis to integrate social preferences for multifunctional peri-urban farming into planning processes. This constitutes an interesting research avenue connecting quantitative and qualitative geography with sociology and planning. Such improved spatial modeling would be especially relevant for some Mediterranean countries in which the state does not produce spatial data on farmland consumption. Specific funding, however, would be necessary to support local researchers' access to such tools and to aerial photos or satellite imagery.

5.2. Involving Farmers and Recognizing Conflicting Points of View in Collaborative and Participatory Processes

Stakeholder-based approaches like collaborative planning and participatory initiatives have become increasingly common when addressing complex policy issues.

However, implementing collaborative and participatory initiatives for FP is complex. The key issue is the diversity of stakeholders. Researchers state a lack of involvement of farmers [114]. The very different types of knowledge held by planners, elected officials and farmers can also make dialogue more difficult [115]. For example, James [116] blames the failure of green zones in Sydney on a lack of consultation with culturally and linguistically diverse small-scale farmers. Considering the role of expertise in FP task forces, Smith Korfmacher and Koontz [117] suggested that professionals work with collaborative groups to determine what information would be useful in the planning process.

Collaborative planning is also difficult because of stakeholders' conflicting points of view. State representatives often advocate urban containment, while local elected officials are often reluctant to counter urban development put forward by interest groups [118]. Another point of divergence relates to the various functions of peri-urban agriculture as defined by different stakeholders (economy, landscape, food, etc.) [37,40]. Around Toulouse (France), as well, Akimowicz et al. [75] stress the need for a better alignment of farmers and other agricultural stakeholders' representations of agriculture. Farmers themselves are not a homogeneous social category. They express diverse and sometimes divergent points of view according to their farming systems, age or land strategy [60,116]. Considering this diversity of farming styles may be another avenue of improvement for FP research and policy [106].

Building a consensus should not mean ignoring these conflicting points of view. It should instead acknowledge stakeholders' perceptions [51] and identify potential value conflicts [30]. Perceptions of injustice are pivotal aspects of land transactions [91]. To avoid the usual resentment toward planning processes, more research is needed on these issues of fairness and social acceptability of FP policies. This also means that planners and researchers could act less as regulators and more as productive mediators to achieve some form of consensus.

5.3. Diversifying Compensation to Improve Social Acceptability

FP issues illustrate how closely intertwined planning, laws and property rights may be. Restrictive zoning impacts property rights, but local negotiations on private rights also raise concerns about financial and non-financial considerations when landowners or tenants waive certain rights. A way to improve social acceptability of FP policies is to diversify types of compensation.

Monetary compensation can be used within collective farming goals, such as supporting land consolidation or collective processing units [30]. Non-monetary types of compensation can be used to overcome contradictory time frames and to avoid conflicting agendas (between local institutions in charge of preservation programs and landowners) and the speculative behavior that increases land prices. In the Netherlands, for instance, landowners are encouraged to demolish vacant buildings, especially empty stables, to improve the overall quality of the landscape. If they do, they receive new building rights [119]. This initiative, called the Space for Space Program, was set up following a European requirement to limit water pollution caused by nitrate emissions from the livestock industry.

It represents a mixed model between the market-oriented programs of rights transfer currently used in the US and the regulatory instruments used in the planning-led European tradition.

In Spain, legal reforms have fostered the use of land readjustment to avoid financial compensation related to expropriations. In the Valencia region, land readjustment was used to create a new neighborhood. Landowners could choose between selling their property or receiving development rights in the adjusted land scheme [120]. The municipality received a portion of the land for infrastructures and public housing. However, such systems may foster urban sprawl. Land readjustment as a bottom-up initiative coordinated by developers may perpetuate local arrangements and prevent the adoption of restrictive planning regulations. Paradoxically, the strongest opponents to such land readjustment schemes turned out to be foreigners owning land in coastal areas, who protested against further urbanization and insufficient compensation. Conflicts arose especially in areas where rural property is very fragmented and where farm buildings were used illegally for residential purposes [121]. When non-financial compensation—a legal instrument initially designed to cope with a specific local issue—becomes a general planning strategy, it does not carry the same procedural guarantees (democratic control) as the more common land-use planning procedures.

Compensation—whether or not financial—should thus be combined with other tools.

5.4. Combining Tools According to the Local Context

While regulatory approaches since the 1960s have remained a topic of scientific interest, there has been a growing focus on incentive-based approaches and market-based instruments over the past twenty years.

These instruments do not work at the same scale in space and time. Zoning regulations protect a large area at limited public cost, but may trigger conflicts with landowners regarding compensation and be subject to renegotiation over time. Conservation easements are increasingly used in countries where zoning is considered a potential regulatory taking. They preserve smaller and not always contiguous areas for much longer periods of time, with some specific drawbacks such as the need to secure landowners' agreement, complexity and heavy implementation costs, etc. [56,62,95,97]. Conservation easements need to be coordinated and targeted at priority funding areas. Consequently, some scholars consider transferable development rights (TDR) as the cheapest way to pursue FP [66]. However, TDR programs are also complex to implement [122].

Thus, many authors conclude with a recommendation that FP tools should be combined. Open space protection policies work better when implemented in combination with compact urbanization strategies [6,118]. TDR and PDR programs can target the same area and reinforce one another in several ways [122]. Land preservation programs (PDR, TDR) can be based on tax incentives. In Lancaster County, Pennsylvania, such tools complement the widespread use of agricultural zoning and urban growth boundaries [65]. Planners and scholars advise combining these types of purchase programs with regional comprehensive land-use planning [71] and supportive zoning [64] for enhanced results.

Most success stories of farmland preservation thus combine tools within a long-term strategy. In the Dutch Green Heart for instance, the “success [of restrictive zoning] can be attributed to its rigidity and clarity, as well as to the use of additional instruments that for example help to purchase land and develop its recreational potential” [29]. However, while combining tools may appear as the soundest solution, stakeholders should remain aware that not all tools can be implemented in every context.

Further research—especially comparing detailed case studies—is thus needed to guide the choice and implementation of mixed-tool FP schemes in local contexts with diversified urban growth patterns, property rights regimes, or farming systems. This should be a fruitful research avenue for geographers working on Mediterranean countries.

6. Conclusions

The aim of this paper was to review the recent literature on the issue of farmland protection in the face of urbanization, with a specific focus on the Mediterranean region. This region is often pointed out

as lacking effective planning policies while struggling with acute challenges related to food security. Yet, the literature underlines that issues related to FP policies are often the same across the world. Hence, our review of FP mechanisms in developed countries may bring valuable insights for more sustainable management of farmland on the urban fringe in the Mediterranean region.

This review highlights that FP cannot rely merely on transferring policy tools that have proven successful elsewhere. It also reveals that farming systems tend to be neglected by FP policies, as these often focus on land rather than on agriculture. FP policies do not always take into account the specific features of the local context and farmers' need for long-term guarantees if they are to invest and develop their activity on the urban fringe. Our review maps several interesting areas of research on the diversity of FP rationales, as well as the barriers and potential avenues for policy improvement. This may be of interest to students and scholars, but also to practitioners, policy makers and local groups looking for innovative, more flexible or locally suited farmland preservation programs.

Twenty years of research and practice have brought a greater understanding of the rationales behind FP. The literature shows that FP is underpinned, supported, and legitimized by disparate political and ethical views, ranging from urban containment and food security to environmentalist and agrarian ideologies. FP is not only motivated by a desire to support farming. Farming may be a means rather than an end in itself, and thus may become a tool to control urban growth and protect the environment and open spaces. These underlying rationales may change over time. They may also advocate for different farming styles (organic or conventional, commercial or hobby farming). Often, such rationales are not explicit because each position (for or against FP, for or against the use of some tools rather than others) is supported by coalitions of heterogeneous stakeholders with mixed interests. Local case studies revealing the underlying motivations and ethics of the stakeholders may suggest policy options that reduce land-use conflicts and help build a shared vision of the value and functions of farmland in the urban fringe. Research on FP rationales is thus a field that deserves renewed attention in sociology or social geography.

We identified recurrent barriers to implementation of FP policies: conflicting rationales, contradictory time frames, and failure to take into account diverse farming systems as well as the local context's unique features. The literature shows that the diversity of stakeholders' sometimes-contradictory perceptions generates resentment towards planning processes and may impede consensus building. However, researchers disagree on the need and the ways to involve local stakeholders and civil society in policy design. Some favor innovative collaborative or participatory approaches. Others stress the recurring risk of lobbying by economic, pro-development or NIMBY interests during implementation. Even when stakeholder participation is viewed as a cornerstone of policy legitimacy and success, researchers find that certain stakeholders, especially farmers, are often excluded from such processes. Farmers may lack the time or the skills to participate effectively in public policy debates. They are often not organized as a coherent social group with homogeneous strategies. Political ecology case studies could be developed to better understand the obstacles in achieving successful dialogue between state or local officials, landowners, developers, farmers, and non-farmer residents—each with their contradictory time frames, disparate ethical views and different types of knowledge.

We proposed further avenues of improvement of FP processes. Scholars should expose value conflicts and issues of fairness, especially in participatory and collaborative approaches. Planners and researchers together could act less as regulators and more as mediators of stakeholder groups to facilitate the coexistence of diverse value systems and agriculture models on the urban fringe and to help identify conflicting opinions before seeking a consensus. This is an opportunity for action-research. Our review also reveals a growing connection between the qualitative literature dealing with local implementation challenges of FP policies and applied literature dealing with land-use change modeling for diagnosis, monitoring, assessment, or prospective purposes. One of the current challenges in this field is to integrate more social data into spatial modeling, but this can only be tackled by interdisciplinary research teams. Finally, our review reveals a growing debate on methods of compensation for FP or urbanization. Here again, critical sociology or social geography approaches

could help unravel the issues of social and spatial justice among various stakeholders, while planners and economists might be more interested in reframing individual compensation within collective goals.

Since the effects of FP programs are incremental and occur over long periods of time, they are difficult to measure. Now that FP policies have been in place for years in several Mediterranean countries, detailed comparative case studies are needed to determine how the toolbox has been adapted to each local context. While more international comparison would be useful—either to examine country-specific characteristics or the use of certain policy tools across various conditions/factors—our review highlights a greater need for more comprehensive interdisciplinary inquiries at the local level in order to reveal how social, spatial, political and economic contexts affect the design and successful implementation of FP policies.

Finally, this review has been centered on planning issues and land policies, but in developed countries, preserving farmland and maintaining farming on the urban fringe are now frequent features of more holistic, cross-sectoral territorial policies in which peri-urban agriculture is valued as multifunctional and as a provider of ecosystemic services and public goods [57]. Research is still needed to understand how these new framings (for instance through urban food strategies [123,124], agro-ecosystems [20] or productive landscapes [125]), may help to design innovative planning instruments, more in line with the emerging needs of urban and peri-urban farmers, as well as city dwellers.

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