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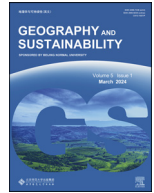
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Research Article

Farm buildings and agri-food transitions in Southern France: Mapping dynamics using a stakeholder-based diagnosis



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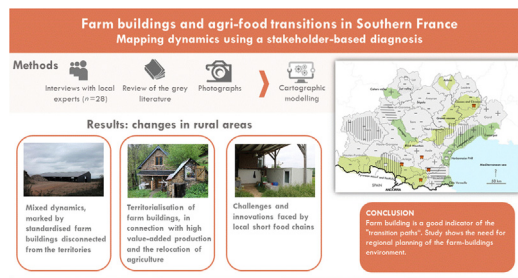
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HIGHLIGHTS

- Mapping of farm buildings shows dynamics of standardisation and territorialisation.
- Farm buildings allow us to understand the trajectories of agri-food transitions.
- Results show issues of access to land, farm buildings and dwellings for new farmers.
- This work highlights the need for regional planning for farm-buildings environment.

GRAPHICAL ABSTRACT



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ABSTRACT

This study's goal is to present a dynamic portrait of the farm-buildings environment in Occitania, in Southern France, in order to better identify the transitions underway in agri-food chains. To this end, we undertook a territorial diagnosis based on actor statements, using 28 semi-structured interviews across Occitania. This diagnosis was enriched by graphic modelling, which enabled the spatialization of the dynamics described. We show that the process of standardisation of farm buildings prevails in the majority of the territories studied. This phenomenon has intensified in recent years with the development of vast photovoltaic-roofed sheds, accentuating the farmland conversion and soil sealing. At the same time, in areas with strong environmental, landscape and heritage contexts, a 'new adventure in farm buildings' (2022 survey) is taking shape. It is primarily driven by local short food chains, which rely on self-construction, repurposing and refurbishment, the sharing of tools and equipment, and which favour the use and reuse of local resources. This study shows that farm-buildings dynamics crystallise many challenges confronting the reterritorialisation of agriculture and food production.

1. Introduction

In the second half of the 20th century, farm buildings started undergoing major transformations in industrialized countries as part of agricultural modernization (Cividino, 2019). New constructions now have to satisfy multiple parameters, including work comfort, the advent of new machinery, cost rationalizations, health and environmental standards, etc. This architectural revitalization represents a break with the traditional farm. Farm buildings are becoming standardised

and industrialised (Tassinari et al., 2007), in line with an agro-industrial and sectoral dynamic (Robinson, 2018). Existing scientific literature has dealt mainly with the issues of the integration of these new buildings into the landscape (Fazio, 1989; Picuno, 2022; Torreggiani and Tassinari, 2012), going as far as to propose models to improve their design (Tassinari et al., 2011). In a sustainability perspective, researchers have also explored innovative farm-building solutions through the use of materials that are cost-effective, have low environmental impact and are recyclable, and by planning buildings with reduced energy consumption

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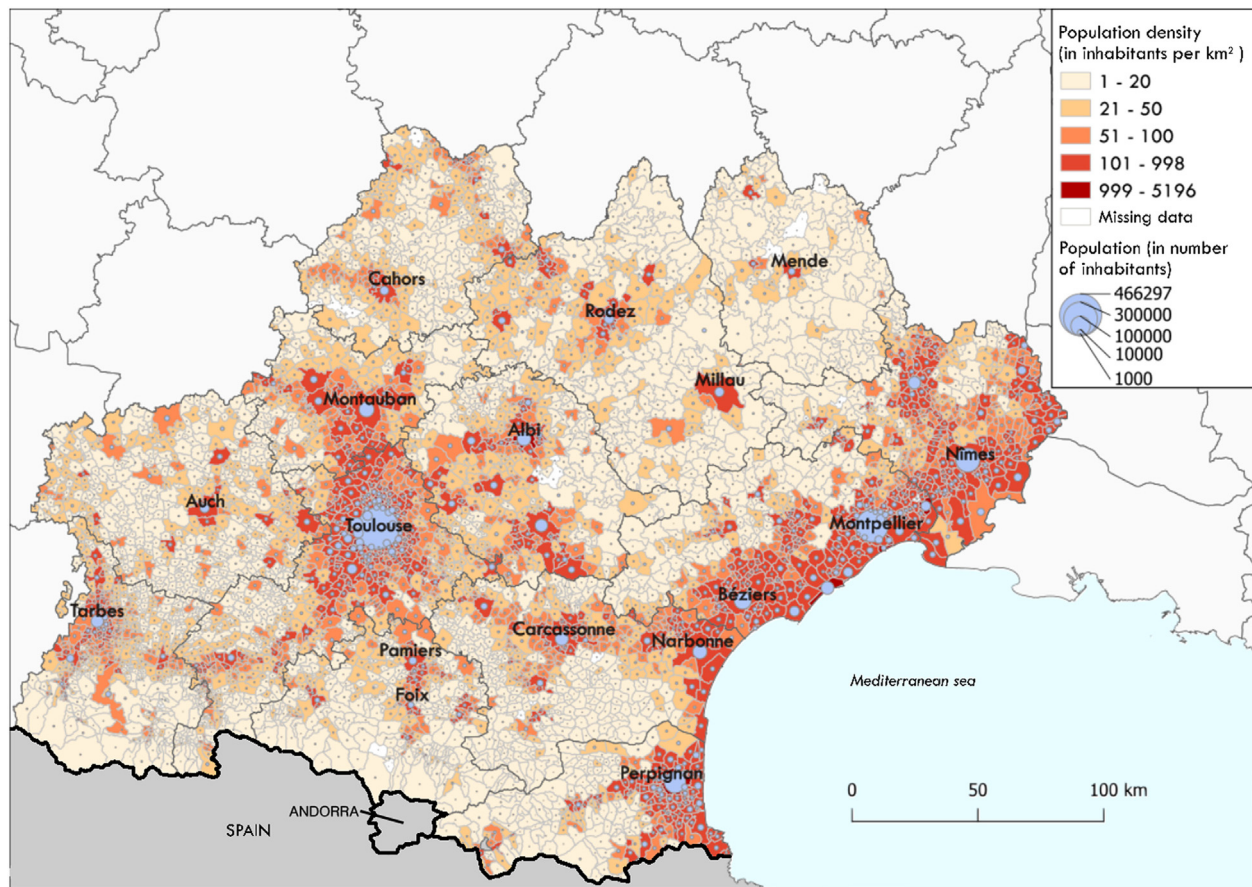


Fig. 1. Population in Occitania in 2019 (by municipality).

(Cividino, 2018; Conti et al., 2016; Dąbkowski et al., 2018; Shon et al., 2023). Dąbkowski et al. (2018) have shown that ecological farming does not necessarily induce the adoption and use of ecological buildings. Researchers have also documented the fate of traditional buildings, and the resulting urban, landscape, economic and heritage challenges. While old farm buildings are often repurposed for other agricultural uses (Fuentes et al., 2010; Mackay et al., 2019), they can also be used for non-agricultural activities (Kristensen et al., 2019; van der Vaart, 2005; Verhoeve et al., 2012).

In contrast, only a few studies adopt a territorial and dynamic approach to contemporary farm buildings, including territorialized food systems' buildings (Nougarèdes, 2018). Territorialized food systems (Lamine et al., 2019), sometimes described as alternative food systems (Goodman et al., 2013), have mainly been studied from a perspective of direct producer-consumer interactions (Goodman, 2002; Holloway et al., 2007), the relocalisation of the economy (Marsden et al., 2000), the territorial anchoring of initiatives (Sonnino and Marsden, 2006), or even new forms of territorial food governance (Morgan, 2015; Torre and Traversac, 2011). There is a lack of clarity on the infrastructure related to this process of (re)territorialization of agriculture and food production. That said, a wide variety of building types are being mobilized for diversifying production and services, on-farm processing, and creating new consumer-proximate markets and marketing channels.

The aim of this paper is to show how the territorial dynamics of farm buildings in Occitania region (Southern France) shed light on agri-food transitions (Lamine, 2020) of farms. By transition we mean an intentional and gradual transformation process, during which a system moves from one equilibrium regime to another (Geels and Schot, 2007). The literature has shown that the transition to sustainability can be

based on a variety of approaches: technocentric, ecocentric, as also hybrid (Robinson, 2009). We propose to highlight these different paths of agri-food transition through the prism of territorial dynamics of the farm-buildings environment. The term 'dynamics' is used here in an exploratory manner, in order to propose a systemic understanding of the farm-buildings environment (architectural, functional, geographical, social, economic, etc., from the scale of a single building to that of the territory). The study of the territorial dynamics of the farm-buildings environment requires us to examine the nature of farming projects, their spatial and landscape footprints, the issues they address and the actors involved. A good understanding of the geographical context is also necessary to determine its potential effects.

2. Materials and methods

2.1. Study area

The Occitania administrative region in Southern France consists of 13 departments, the majority of which are predominantly rural. With an area of 73,000 km², this region is home to 6 million inhabitants (2019¹). While the average population density is 81.6 inhabitants per km², it varies markedly (Fig. 1). There are ten protected parks (two national parks and eight regional natural parks) in the region, mainly in rural and mountain areas (Fig. 2).

Occitania comprises four main landscape entities: the foothills of the Massif Central, the plains and hills of the Midi-Pyrénées, the moun-

¹ Data produced by the French National Institute for Statistics and Economic Studies (French: INSEE). www.insee.fr

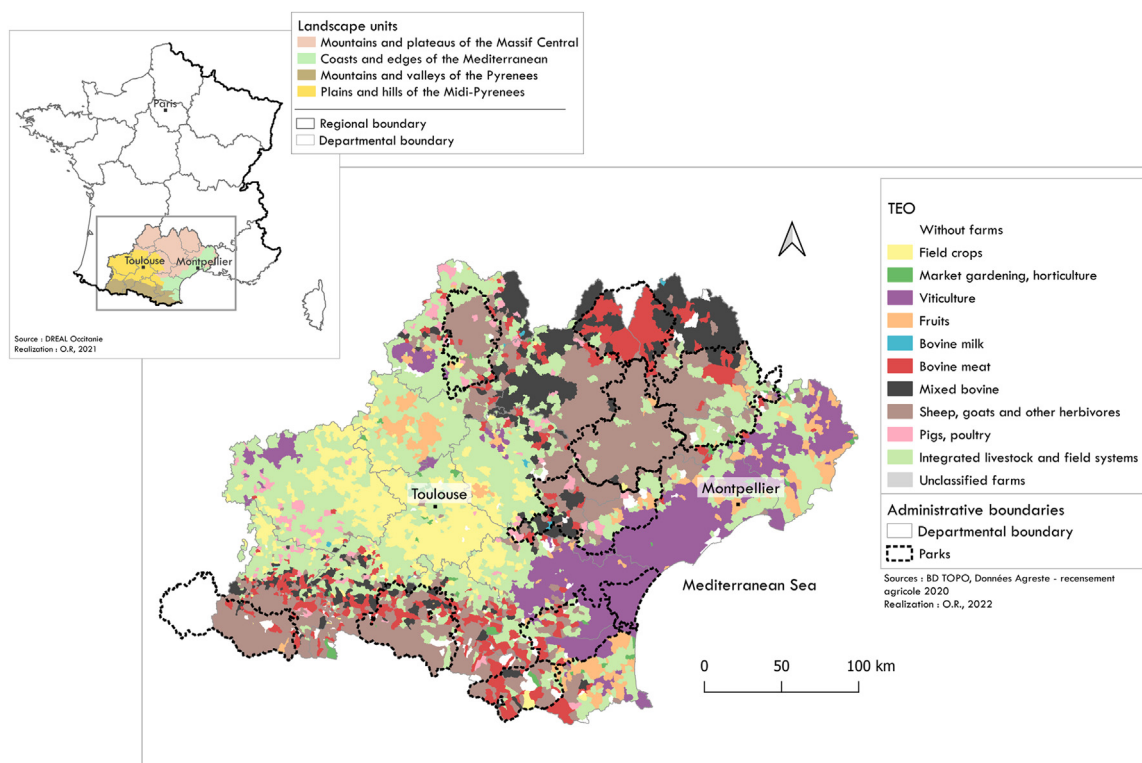


Fig. 2. Landscape units and technical/economic orientation (TEO) of farms in Occitania.

tains and valleys of the Pyrenees, and the coastline and its inland areas (Fig. 2).

Different types of agriculture correspond to these landscape entities, such as viticulture on the Mediterranean plain, livestock farming in the Pyrenean mountains and on the Massif Central Plateaus, mixed crop-livestock farming in the foothills and valleys, and cultivation of field crops on the Midi-Pyrenean Plain (Fig. 2).

With 161,400 agricultural workers (2019³), the agricultural and agri-food sector in Occitania is a significant source of employment, especially in rural areas. More than half of the region's surface area is devoted to agriculture. Crop production alone accounts for 57% of agricultural turnover, compared with 37% for livestock farming (source: CRAO, 2019). Agricultural censuses (2010 and 2020) have shown that, over the last decade, the decline in the number of farms has been smallest in the market gardening-horticulture sector (−3%), with other sectors experiencing a more marked decline. There are several factors behind this attractiveness of the market gardening-horticulture sector, including the fact that it does not require a large initial capital. In addition, the demand for locally produced plant products and for short supply chains has increased, encouraging a diversification of agricultural production in territories that were hitherto not very diversified.

In line with the rest of France and Europe (Verhoeve et al., 2012), the average size of farms in Occitania is increasing while the number of active farms continues to decrease.⁴

The key agricultural data are shown in Table 1.

Agriculture in Occitania is, on the whole, a stable economic sector (7 billion euros in turnover, average over 2018–2020; CRAO, 2021), notably due to the diversity and complementarity of its productions. It is also notable for the numerous productions involved in value-adding ap-

proaches: almost half the farms come under the ambit of an official sign identifying quality and origin (SIQO) and nearly one in six farms is certified organic, making Occitania the leading organic agricultural region in France. Some farms undertake diversification activities (processing, short circuit sales). 24% of farms sell in short circuits, as compared to 15% in 2010.

2.2. Method: stakeholder-based analysis of the farm-buildings environment

Our stakeholder-based territorial diagnosis relies on an analysis of the results of interviews with local experts ($n = 28$) and on a review of the grey literature. The results were then modelled graphically.

Geographers use graphic modelling of a territorial diagnosis to situate the various stakeholders' perceptions and to rank the dynamics and issues according to their spatial extent and the intensity of the problems concerned (Lardon and Houdart, 2017; Lardon and Piveteau, 2002). The significance of this approach is that it allows us to identify phenomena that are difficult to measure (Mucchielli, 2009) and to compensate for a lack of quantitative data and up-to-date sources (Morange and Schmoll, 2016). Our approach also helps overcome the lack of quantitative data on farm buildings according to the type of agri-food chain and the mode of marketing (e.g., direct sales).

Some researchers have also used graphic modelling of a territorial diagnosis in the context of participatory action-research projects in order to create a space for dialogue, for co-construction of knowledge and for decision support within a territory (Caron, 2001). Indeed, graphic modelling of a territorial diagnosis makes it possible to present the results to stakeholders in a more tangible and approachable way than is possible through a usual written report (Lagarde et al., 2021). Recent work has confirmed the relevance of this approach in understanding agricultural, environmental and rural issues at various scales, with a view to developing theoretical models, or for evaluation purposes (Lardon and Houdart, 2017).

The 28 semi-structured interviews were conducted and transcribed between December 2020 and October 2022. We decided to carry out our

³ Data produced by the Occitania regional Chamber of Agriculture (French: CRAO). <https://occitanie.chambre-agriculture.fr>

⁴ This decline in the number of farms is especially marked in the case of micro-farms and smallholdings.

Table 1Key agricultural data (source: RA 2020²). Note: UAA, utilised agricultural area; SIQO, signs identifying quality and origin.

Total UAA	Farms	Farmers	Main crops and UAA				Average farm size	Value-addition approaches
3.1 million ha	64,370 - 18% as compared to 2010 37% have no identified successor	77,546 owner and co-owner farmers - 15% as compared to 2010 Average age: 53 years	Permanent crops 392,721 ha 19,715 farms	Field crops 900,230 ha 16,064 farms	Mixed crop-livestock and/or poly-livestock farming 340,337 ha 5,622 farms	Livestock farming 1,315,139 ha 20,147 farms	48.6 ha (compared to 40.5 ha in 2010)	SIQO 32,527 farms of which 10,790 farms are organic On-farm processing activities in 6,598 farms

surveys mainly with actors from national and regional parks⁵ and the Councils for Architecture, Urbanism and the Environment (CAUE⁶), as these organisations are present in every French department and they develop and support agricultural and rural projects (including farm buildings) with a territorial and landscape approach. Within the parks, we interviewed individuals in charge of and specialising in agriculture, architecture, landscape and heritage, as well as spatial planning and urban development. We also interviewed architects, geographers and landscape architects in the CAUEs of all the departments of Occitania ($n = 16$). Two representatives of departmental Chambers of Agriculture were also consulted, as well as two architect-researchers specialising in farm buildings, one of whom is affiliated with a self-construction cooperative (Farmers' workshop, *Atelier paysan*). Finally, we interacted with a representative of Hérault's *Direction Départementale des Territoires et de la Mer*⁷ (DDTM, Departmental Directorate of Territories and the Sea). We asked all the interviewees about the evolution of farm buildings in the agri-food chains in their territory, as well as the current dynamics and challenges. We also asked them about the place and role of farm buildings in the transition to more sustainable food systems, with regard to multiple issues (social, economic, landscape, architectural, zootechnical, ethical, functional, ergonomic and environmental). During the interviews, we accorded particular importance to the spatialization of information in order to characterise the spatial and landscape footprint of the farm-buildings dynamics described. Although we reached saturation point fairly quickly as regards the dynamics described, the territorial deployment of these dynamics may unfold differently, which justifies the 28 surveys to cover the whole region.

The interviews were transcribed and analysed using a thematic analysis grid. We then selected the thematic elements that could be mapped based on the frequency with which they were mentioned by the interviewees.

⁵ In France, National Parks and Regional Natural Parks (French: PNR) are two types of protected areas that differ between themselves in terms of governance, and modalities and degrees of protection of natural environments (fauna, flora, landscape). A National Park is managed by the State. It is composed of an uninhabited or sparsely populated 'core' subject to strict environmental protection regulations, and an 'accession' area with regulations that are less strict. A Regional Natural Park (PNR) is an inhabited area, managed by the Regional Council. Its dual purpose is to protect the environment and promote sustainable economic development.

⁶ The Councils of Architecture, Urbanism and the Environment (CAUE) are public interest organisations. Their purpose is to raise awareness, train and advise individuals and communities in order to promote and improve the architectural, urban, landscape and environmental quality of the territory concerned.

⁷ A DDTM is a public service that implements policies for the sustainable planning and development of territories at the departmental level. Its activities are overseen by the Ministry of Ecological Transition and Territorial Cohesion, the Ministry of Agriculture and Food Sovereignty, and the Ministry of the Interior and Overseas Territories.

We integrated these elements into the Quantum geographic information system (QGIS) and the Inkscape computer-aided drawing (CAD) software. To gain additional clarity and perspective on the information obtained from the interviews, we consulted the grey literature (reports and websites of parks and CAUEs, park charters, and CAUE brochures on farm buildings).⁸ Finally, photographs were taken to illustrate the dynamics described.

3. Results

3.1. Characterisation of the main dynamics of farm buildings in Occitania

As our analysis grid shows (cf. Table 2), 16 dynamics recur in the discourses, some of which combine spatially.

We mapped these dynamics in order to identify those that overlap. The respondents referred to various geographical entities to localize these dynamics: small agricultural regions, landscape entities, administrative boundaries, or even land use or technical/economic orientation (TEO) of farms. This mapping allowed us to group the 16 dynamics into 8 thematic categories, based on spatial aggregations. In other words, if two dynamics were cited for the same geographical entities on a recurring basis, we grouped them together (cf. Table 2).

Fig. 3 shows the spatial distribution of these thematic categories. The dynamics of the farm-buildings environment identified during the interviews often appear mixed and heterogeneous, reflecting a diversity of agricultural and food models, and of transition paths in each territory. The predominant dynamics manifest as specialised, enlarged and standardized farm buildings. Over the last few years, photovoltaic panels have begun to be installed to meet energy transition objectives (light grey). These new buildings have replaced old, dilapidated farm buildings that are not suited to current agricultural practices (-). The dynamics of territorialization of farm buildings (dark green and light green) are also recurrent in the respondents' discourses, even though they have a lower landscape impact. Approaches for the refurbishment of old buildings are being developed, mainly to receive the public (+). Territorialization is a process driven by collective - local - territorial dynamics. In the agri-food sector, this means maintaining small production units, artisanal transformation processes, and the development of collective marketing projects implying a diversity of local activities (Lamine et al., 2019). The local short food chains are also implementing a variety of innovative solutions for farm buildings (small points).

⁸ We must note that the corpus of documents compiled for this purpose was not subjected to a specific textual analysis or literature review as we are focusing here on the discourse of stakeholders. It could, however, be interesting to extend this documentary research in the future, for example to study the specific features of the Parks' charters on the farm-buildings environment and their effects.

Table 2

Categorisation of dynamics of farm-buildings identified in interviews. *Note:* the numbers in brackets correspond to the number of respondents who mentioned the dynamic in the interview; WWOOF, Worldwide Opportunities on Organic Farms. The most important dynamics are indicated by a '+' and those less represented are indicated by a '-'.

Dynamics	Category							
	Mixed dynamics, with a trend towards standardization and photovoltaic installations	Mixed dynamics, with a trend towards territorial differentiation	Old buildings upgraded for agri-food activities	Refurbishment of old farm buildings for residential use (non-agricultural use)	Abandonment of old farm buildings	Shanties or makeshift constructions (including those linked to WWOOF-ing)	Makeshift agricultural housing linked to seasonal agricultural work (fruits)	Innovative solutions related to the development of local short food chains
Dynamics of standardization of farm buildings (21)	+	-						
Dynamics of territorial differentiation of farm buildings, with territorial specificities and good landscape integration (21), of which dynamics pertaining to local short food chains (excluding viticulture) (11)	-	+						
Farm buildings with photovoltaic installations (19)	+	-						
Abandonment of old farm buildings (13)			-	-	+			
Lightweight building (13)								+
Refurbishment of old farm buildings for agri-food activities (excluding viticulture) (12)		+	+	-	-			+
Refurbishment for non-agricultural residential purposes (12)			-	+	-			
Sharing of farm buildings (excluding viticulture) (12)								+
Refurbishment in the viticulture sector (11)		+	+	-	-			
Ecological constructions (use of local resources, reduced production of waste and energy consumption) (11)								+
Public agri-food building (9)								+
Self-construction of farm buildings (7)								+
Mobile building or building alternatives (7)								+
Shanties or makeshift constructions (6)						+		
Seasonal-agricultural housing issues (4)							+	

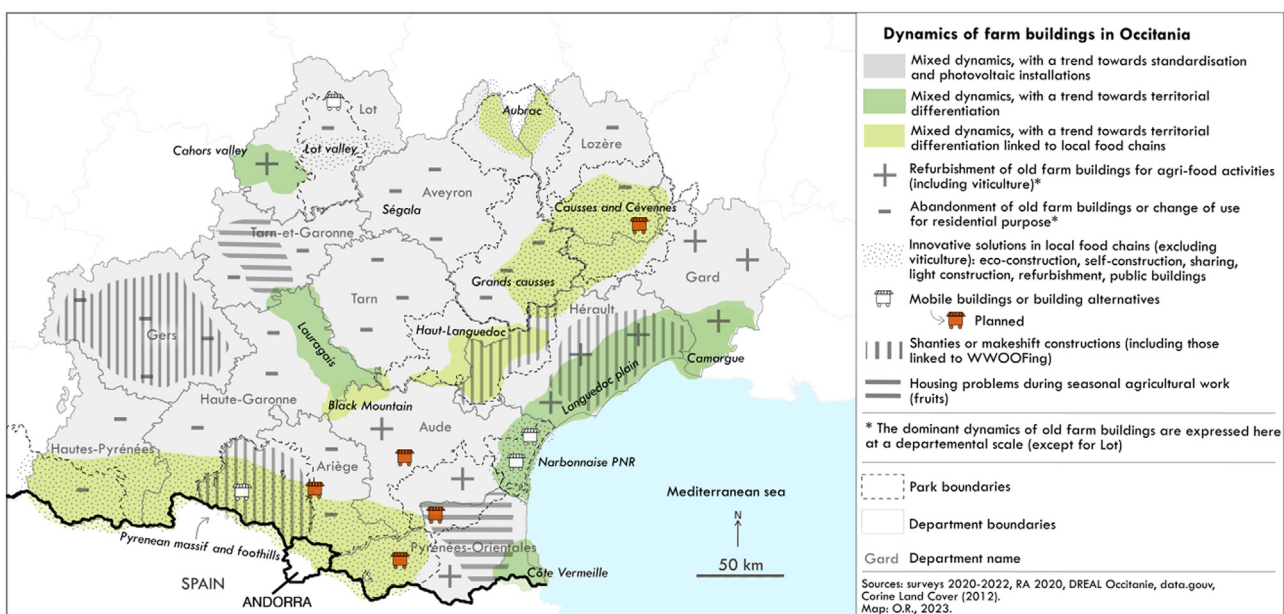


Fig. 3. Summary map.



Fig. 4. Industrial farm buildings and silos used for sheep farming, located on both sides of an old farm building, Causse Méjean, southern Lozère. Photo credit: O.R., 2022.

These latter are indicative of other transition trajectories, which could be described as more alternative. These trajectories have their own challenges, notably in terms of access to land and housing (hatching).

We propose to explain these territorial dynamics of the farm-buildings environment in the following sections through a detailed thematic analysis.

3.2. Mixed dynamics, marked by standardized farm buildings disconnected from the territories

A trend towards the standardization of agricultural buildings was observed by the interviewees across the majority of the regional area. This phenomenon stems from a process of modernisation of infrastructure and specialization in the agricultural sector. In recent years, large photovoltaic sheds have been added to this dynamic to address the challenges of the energy transition.

3.2.1. Ambivalence of the modernization of farm buildings

A large majority of interviewees ($n = 21$) noted a trend towards the standardization and increase in size of farm buildings, as well as a specialization of their functions. ‘The traditional buildings are no longer at all suitable, firstly because of their [limited] size - the herds no longer fit in them - and secondly because of the equipment - they cannot accommodate the big tractors’, says a project manager of the Grands Causses Regional Natural Parks (PNR in French). The reduction in the number of farm workers is being compensated by new farm machinery, which needs to be stored/parked. Interviewees admit that these agricultural constructions have contributed to the farmland conversion and soil sealing. The majority of respondents, however, consider this decommissioning to be necessary because the old buildings are inconvenient, cramped and often close to residences. ‘A building must improve the working conditions of the farmer or the employees [...] and modernization is therefore essential’, explains a representative of the Lozère Chamber of Agriculture.

The advent of such buildings is evidence of a paradigm shift towards agricultural productivism. ‘The big debate at the time was between the agri-chain and the terroir. Should we base our activities on the geography and the landscapes, or do we need to have an agri-chain approach, and therefore deal with its normative constraints?’, asks a consultant architect from Tarn and Garonne CAUE. When considered as a work tool, an agricultural building must, above all, be functional and viable for a farmer with limited financial resources. However, this process of industrialization and modernization of agricultural buildings is not in itself incompatible with an architecture rooted in the territory in which they are located. ‘Just because we are making industrial buildings does not mean we should forget their territorial aspect’, cautions an adviser of

the Gers CAUE. Nevertheless, the responsibility of construction of these new industrial farm buildings is generally entrusted to specialized companies. They offer different models of standard buildings (Fig. 4). The use of standardized and low-cost materials such as metal is especially widespread. At the plot level, major earthwork is sometimes necessary to construct a new agricultural building. Landscape integration is rarely a priority, especially as these new buildings are situated where land on the farm is available for them, i.e., they are sometimes not near the cluster of the farm’s main buildings. The transferability of such farms also becomes an issue. ‘Since the farms are so big now, no buyer can afford them. These farms have gained enormous value and the young people who want to take up farming are unable to buy such farms’, notes a project manager of the Grands Causses PNR.

Faced with this phenomenon of standardization of farm buildings, awareness-raising campaigns are being conducted by the parks, the CAUEs and the Chambers of Agriculture. The recommendations pertain to the integration of buildings into the landscape, for example, not only by avoiding ridge areas, but also in terms of colours, materials and morphology. However, these improvements involve additional costs. ‘Ten years ago, the region provided substantial help in this regard by covering the extra costs for materials that were qualitatively or environmentally appropriate’, explains the same forementioned project manager of the Grands Causses PNR.

3.2.2. Specific buildings for a variety of agricultural productions

Most often, these new buildings meet storage/parking needs (equipment, crops and fodder) and livestock farming requirements (stalls, sheep pens, etc.). In Tarn and Aveyron, many sheep pens and storage sheds for the sheep dairy sector have been built or expanded in recent years. But overall, all agri-chains need new buildings, especially due to mechanisation. ‘The entire agricultural sector needs farm buildings, even cereal farmers. After all, farm machinery is nowadays very big and one has to store or park it’, explains a representative of the Tarn Chamber of Agriculture.

In Pyrénées-Orientales and Haute-Garonne, vast sheet-metal sheds continue to be built in the plains to house cold storage facilities for fruit. In these same departments, large market garden greenhouses have been constructed on the outskirts of large cities, especially around Perpignan and Toulouse. These are usually plastic tunnels or glass greenhouses.

In Gers and Tarn-et-Garonne, long supply chain cereals are the main agri-chains that require new agricultural buildings, but they are not the only ones. ‘While there may be significant building projects on new farms for stabling, etc., they are not many in number, because cattle and sheep farming in Gers is not very big. 90% of the farm buildings that we see are for storing wheat and straw’, indicates an advisor from

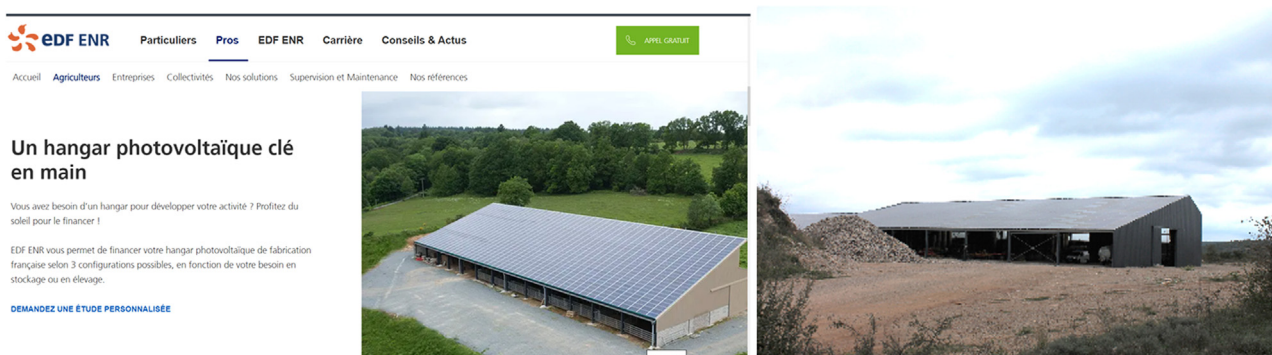


Fig. 5. Example of an advertisement for a photovoltaic shed and of a recently constructed photovoltaic shed in north Hérault. Photo credit: O.R., 2022.

the Gers CAUE. In the plains of Hautes-Pyrénées, large poultry buildings and storage sheds have been coming up for several years. ‘These are disproportionately big buildings, with large volumes’, notes an architect of the CAUE. In mountain areas, this type of construction is found in a more limited number because of the harshness of the climate, topography and small plot sizes. In Ariège, large industrial farm buildings are concentrated on the plains, for the livestock and field crops agri-chains. For several years now, large semi-industrial cheese dairies are also being set up in the Pyrenean foothills. In Lozère, such industrial buildings are mainly found in cattle and sheep farming areas. Following the return of the wolf a few years ago, large cattle sheds were built on the causses. In Lot, the building standardization phenomenon is more nuanced. ‘We are in a rather complicated territory, which does not have large farms because of its geography, because of its soil, because of a whole bunch of parameters, so we are restricted to fairly reasonable sizes’, explains an advisor from the Lot CAUE. However, in livestock farming areas, vast industrial buildings are being erected.

In the peri-urban areas of coastal departments such as Hérault, Aude and Gard, the issue of the standardisation of farm buildings is secondary to that of urbanisation. ‘Our concern is not the farm building, it’s urban sprawl, it’s the construction of dwellings’, says an advisor-architect of the Hérault CAUE. In this department, new agricultural buildings are indeed located further inland, and are concentrated in the livestock and wine agri-chains (for storage, animal housing and accommodation). Demands for new buildings by market gardeners are also on the increase, especially in proximity to urban areas. In Aude, similar dynamics have been identified but in a more moderate way in the wine and cereal agri-chains.

3.2.3. Photovoltaic sheds: between an energy transition and (over)consumption of space

Over the past decade, an increasing number of agricultural sheds have been covered with solar photovoltaic panels. Although the initial objective, which is to take advantage of built-up areas to produce renewable energy, is part of a sustainable development approach, the incentives offered by the government lead to an overconsumption of space and an overproduction of buildings. ‘We have an artificial phenomenon of the construction of agricultural buildings just so that they can be used to install photovoltaic panels. This is driven largely by attractive electricity buy-back tariffs,’ says an adviser to the Gers CAUE.

Photovoltaic installations on agricultural sheds is a solution for obtaining a new farm building at a reduced economic cost. While contractual arrangements with solar developers often remain unclear, it is common practice to have a photovoltaic-roofed building paid for in exchange for the energy produced by the solar panels (Fig. 5). The farmer has to pay only for the earthwork, development of the surroundings, and provision of access to the building.

Photovoltaic-roofed buildings are now found in all of Occitania’s departments and are already clearly visible across the landscape. ‘Without the photovoltaic factor, I do not know what the level of activity of farm-buildings construction would have been in the Gers department’, says an adviser to the Gers CAUE. ‘The sheds are all photovoltaic now’, observes a project manager from the Hérault DDTM. Turnkey solutions are offered to farmers by specialised companies, which are actively canvassing farmers for new installations (Fig. 5). These buildings, often found on the larger farms, are of poor architectural quality and do not harmonise into the landscape. ‘Often, photovoltaic installations are on large farms with industrial-type buildings, with asymmetrical roofs (Fig. 5). They are often located anywhere land is available for them; there is no thought given to integration into the landscape or to their architectural quality’, bemoans a project manager of the Ariège Pyrenees PNR. In the National Parks, new photovoltaic projects are systematically forbidden in the core zones. But what about elsewhere? The PNRs and CAUEs do not have the authority to restrict or prohibit these constructions. ‘We can make recommendations, raise awareness, but we do not have any absolute power to regulate or refuse’, notes an advisor from the Lot CAUE.

The roofs are designed above all for the installation of photovoltaic panels: ‘South-facing and with a 45° slope’, indicates an advisor-architect from the Pyrénées-Orientales CAUE. According to a majority of respondents ($n = 19$), the agricultural dimension of the building tends to become secondary. ‘We see that it is more a financial opportunity than a real agricultural project [...] with the idea of feeding the electricity generated into the grid. And everything else that happens alongside, the agricultural project, the project for insertion into the site, landscape integration and the cultural aspect are swept aside’, explains an advisor-architect from the Ariège CAUE. The objective is to cover as much surface area as possible in pursuit of profitability. ‘Some photovoltaic installers do not go below 600 m²’, explains a project manager from the Haut-Languedoc PNR. As a result, the buildings are often oversized for their agricultural uses. ‘We have some buildings where there is not even any fodder or animals, nothing, and yet it is 40 m to 50 m long’, explains an advisor-architect from the Hautes-Pyrénées CAUE. A representative of the Lozère Chamber of Agriculture notes, however, that projects are now better supervised by the appraisals department: ‘In the permit application file, there is a page that allows the appraisals department to verify the farmer’s actual needs [...], the appraisals department knows that for so many animals such and such a volume of hay is required’.

In short, the dynamics observed show a significant renewal of buildings within all agri-chains in response to multiple issues (change in health standards, farm modernization and expansion, ergonomics and work comfort, animal welfare, etc.). The new constructions, whose market is dominated by specialised companies, are characterized by a standardized morphology disconnected from the territories in which they are located. More recently, the advent of photovoltaic-roofed farm sheds to meet energy transition objectives is leading to a high consumption of space.

Other farm buildings are also emerging but in a more modest way, related to the reterritorialization of agriculture and food.

3.3. Territorialization of farm buildings, in connection with high value-added production and the relocation of agriculture

Territorialized farm buildings⁹ are also coming up in Occitania, but in a small-scale and scattered manner. The actors we interviewed do not use the term ‘territorialized buildings’ but instead refer to ‘qualitative’ or ‘virtuous’ buildings. Buildings in this classification meet several criteria, such as surface area (which is based on actual needs), architecture (shapes, sizes, materials, colours), and landscape and territorial integration. ‘Here we are in the context of activities on a very human scale where particular care has been taken to construct wooden buildings and to make things that are quite thoughtfully inserted into the landscape’, indicates, for example, a project manager of the Ariège Pyrenees PNR. We have chosen here to develop the notion of territorialized building because we consider it more suitable and explicit, in view of the initiatives mentioned by the interviewees. Indeed, the term ‘qualitative’ can refer to a multiplicity of qualities, without being linked to the territory (for example, photovoltaic-roofed buildings have qualities in terms of energy). However, the actors surveyed insist on the territorial anchoring of buildings.

3.3.1. A distribution of territorialized farm buildings in ‘archipelagos’

While territorialized building projects have been identified by the interviewees ($n = 21$) almost everywhere across Occitania, they tend to be concentrated in territories with strong environmental, heritage and landscape contexts, i.e., the parks, certain wine-growing and high-altitude areas. In these territories, there still exists a certain architectural sensitivity and culture. ‘Mountain inhabitants are more considerate of their landscapes than are those of the plains’, explains an advisor-architect from the Hautes-Pyrénées CAUE. Also, in some cases, the farm owners consider their farms more as places for living (as well as for working), leading them to take better care of this landscape. Neo-rural populations are very well represented in this group.

Some territories, such as the parks, also have access to a pool of experts with skills in many fields (architecture, environment, heritage, agriculture, energy, etc.) and are able to implement engineering solutions that harmonize architecture, heritage and landscapes with requirements of agriculture and local agri-chains. Using awareness-raising mechanisms, advice, consultation and regulation, the parks help create an architectural and landscape quality at the scale of their territory. This is notably the case of the Cévennes National Park. ‘We have engineering expertise, we have an architect at the park who is there to advise and support people, we have technicians, we have the CAUE, we have people working on projects [...], there are great experiences’, explains a project manager of the Cévennes National Park. This engineering of the farm-buildings environment thus makes it possible to develop coherent strategic orientations at a territorial scale. ‘It is looking beyond protection, it is the vocation that we want to give to a place, the vocation where the direction towards which we want to go is displayed from the start [in a park], whereas in the other [territories] it is not as clearly defined’, says a landscape consultant from the Haute-Garonne CAUE.

Proximity to urban areas also seems to influence the design of farm buildings, in the sense of better preservation of the landscape. For example, in Lauragais (Haute-Garonne), where field crop farmers are closer to towns and have higher incomes, the architectural culture is more deeply rooted. ‘We have a building typology that is more modern, we manage to have rectangular volumes, quality things’, explains a landscape consultant from the Haute-Garonne CAUE. The fact that these farmers have

higher incomes - compared with their counterparts in other agri-chains in the region (such as of livestock farming) - is undoubtedly another important explanatory factor. ‘They are quick to approach architects and others directly’, points out the same landscape consultant. The sensitivity of farm owners to architecture and the landscape is thus tied to their economic capital as well as to their cultural capital. More broadly, this observation from the Lauragais region highlights the importance of taking account of farm buildings and environments from the perspective of symbiosis with urban areas.

3.3.2. Leveraging agricultural architectural heritage to welcome the public

Within the heritage and high value added by agri-chains such as viticulture on the Languedoc plain, some old buildings are being refurbished. While most wine farms and private and cooperative cellars that were located in the villages had been decommissioned, the estates are regaining an agricultural function, with the development of wine tourism activities. This important farm-buildings heritage is suitable for activity diversifying projects. In Pyrénées-Orientales, a winegrower has, for example, set up a restaurant and a sales area in an old farmhouse. ‘It was a building in the middle of the vineyards, he just renovated and reinvested’, explains an advisor-architect from the CAUE. New reception buildings are also being constructed in some cases, notably for cultural events. ‘Their aim is to diversify by welcoming the public, they do wine tourism and pursue a more qualitative development because they create new sales cellars, they hold open days, and schedule festive events around the cellars’, explains an advisor-architect of the Hérault CAUE. Wine estates and traditional Camargue bull herd ranches in Gard have also been renovated.

A similar process is taking place in the Cahors valley in the high value added wine agri-chains, with the development of luxury wine tourism projects geared towards export. ‘It’s a movement that started ten or fifteen years ago by people who made fortunes [...] and who built up the wine estates’, explains an advisor from the Lot CAUE. In cases where it was not possible to reuse existing infrastructure, wine warehouses and laboratories with contemporary architecture were built. ‘We are leveraging the value of old buildings, and at the same time using a very modern style, with the use of very contemporary materials. Buildings are even being made of metal’, says the same advisor. He notes that old châteaux also serve as showcases for this international business, reserved for a certain high-class fringe of society: ‘While the hotel and the restaurant are there mainly to welcome the tourist clientele and to make the vineyard viable, [the château] is a visiting card to welcome a wealthy international clientele and to pursue wine exports’. The cost of such projects sometimes exceeds a million euros, as in the case of a biodynamic viticulture laboratory constructed by a former computer specialist who is launching himself into agriculture.

In the food-producing agri-chains, old buildings (sheds, barns, sheep pens, etc.) are sometimes converted into gîtes and reception areas, but in a more incidental way. ‘The challenge is to rework things that will add value to the product’, noted a landscape consultant from the Haute-Garonne CAUE. This is especially the case in livestock and mixed agri-chains (mixed-crop farming, mixed crop farming-livestock) in Lozère, Aveyron and the Pyrenees. In these territories, projects concerning mountain huts and farm accommodation have made it possible to reinvest in and refurbish old farm buildings. In Grands Causses, shepherd’s huts have also been refurbished and converted into tourist shelters with the support of the park. ‘We have succeeded in supporting a number of new farmers in converting them [the old animal shelters] into what we call “lodges”, i.e., we use them as bivouacs to accommodate hikers’, says a project manager of the Grands Causses PNR. A similar initiative has been carried out in the Pyrenees.

However, the spatial configuration of the old buildings limits their reuse because they are not necessarily easy to reach or because they are sometimes located in the immediate vicinity of the production buildings, where farm machinery (tractors, harvesters, etc.) is often moving around. Also, it may be a problem to refurbish certain buildings, espe-

⁹ This includes buildings in the entire agri-food production chain, i.e., buildings used for production, processing, distribution and waste recycling/management.



Fig. 6. Diversity of direct sales shops. As shown in photos 1 and 2, the refurbishment of old buildings is very common for sales purposes: traditional farm buildings (photo 1, Ariège) and village buildings (photo 2, Lozère) can be converted for this purpose. Mobile and temporary solutions are also being implemented, most profitably on the side of a busy road, as in the case of this shop in a caravan, along a secondary road (photo 3, Ariège). The practice of sharing of these buildings amongst producers is very widespread. An outlet can offer a wide range of products, as is the case with the shops in photos 2 and 3. Photo credit: O.R., 2022.

cially if they have been exposed to harsh weather for many years, during which they were not maintained. In addition, old buildings sometimes have structural constraints that limit or prevent any refurbishment. ‘An opening cannot be made in an arched vault [...], and the problem with these buildings is that they are all black inside [dark], it is very difficult to let in daylight, it is very complicated and very expensive’, says a project manager of the Grands Causses PNR. And lastly, refurbishing can be costly and complex due to the difficulties in sourcing materials (e.g., stone slates) and the disappearance of traditional local know-how.

3.3.3. Farm buildings of local short food chains: solutions to equip transitions?

Do local short food chains (SFC)¹⁰ mark the beginning of a new era in farm buildings construction? Several of the interviewees ($n = 11$) were in no doubt about this. Frugal buildings, multifunctional buildings, collective sales outlets, light and mobile buildings, etc. are the various solutions being implemented by farmers for purposes of production, storage, processing, distributing and housing. We found them in particular in areas with strong landscape, environmental and heritage contexts (parks, mountains and foothills), as well as in areas that experienced a significant rural exodus (Cévennes, Pyrenees) and thus had good availability of land in the 1970s.

The experts surveyed noted a significant proportion of new people entering farming without coming from a farmer family. Ariège department, which has experienced a sustained rural exodus from as far back as the 1850s, is an instructive case in this regard. For these new farmers, the life project dimension is often crucial, and ‘the logic of profitability does not always come into play’ (survey 2022). In this territory, farms that follow this philosophy sell their products in niche markets and through direct sales. They tend to be small organic farming units (certified or not) with high added value per hectare. Such agricultural projects do not necessarily continue over a lifetime, but instead run for about ten years, which leads to a different approach to investments (including in farm buildings). The respondents also observed an increase in collective farm units involving at least three people. These projects may be carried out by people with higher education, with the desire to live on the farm. Through these projects, the new farmers are demonstrating that there are other ways of conceiving agriculture and rurality.

By choice or by constraint, these small-scale local farming projects tend not to systematically resort to bank loans or public aid. Instead, they are increasingly mobilizing participatory funding. ‘All these young farmers do not have the same conception of profitability as their el-

ders did in the 1980s, so they rely a lot on crowdfunding’, observes an advisor-architect from the Pyrénées-Orientales CAUE. This participatory support makes it possible to finance self-construction projects, as this practice is not eligible for state aid for the modernisation of equipment.¹¹

But on the whole, the respondents explain that they have little information on these projects, especially because they are few in number, do not stand out in the statistics, and may be temporary and/or movable. They have a small impact on the landscape and their existence is often justified and rationalized as much as possible (small areas, judicious use, little new construction). However, the experts interviewed note a growing interest in local agri-food chains in recent years, especially since the Covid-19 pandemic, leading to the construction or refurbishment of buildings. Three major categories of buildings can be distinguished depending on their functions: distribution (Fig. 6), processing (Fig. 7) and production (Fig. 8). These functions are sometimes combined within the same building.

Despite the low visibility of farm buildings in local SFCs, the examples studied reveal the capacity of farmers to deploy solutions that are sustainable, contextualized and collaborative, which they do by relying on sharing, self-construction, eco-construction, refurbishment, etc., with materials at hand, and by proposing multifunctional, dismantlable, mobile and modular solutions. Nevertheless, the farm-buildings environment continues to face several challenges which hold back the full development of these agri-chains.

3.3.4. Challenges faced by local short food chains

In discussions with local experts about the issues of farm buildings in the case of local short food chains, problems of access to land were mentioned several times ($n = 12$). Finding a place to set up the farming project is one of the first difficulties encountered by new farmers. Farmers who do not come from an agricultural background are particularly affected, as a project manager of the Aveyron CAUE pointed out: ‘As far as I know, their problem is that they have trouble finding land’.

Difficulties in accessing agricultural land and buildings are worse in areas with high tourist pressure (Aubrac, Cévennes, Pyrenees) or demographic pressure (Mediterranean plain and coastline, outskirts of large towns). They can also be particularly acute in protected areas and on the coast. In the Narbonnaise PNR, several market gardening projects have been blocked due to the ban on tunnel greenhouses.

Housing needs were also flagged by respondents, especially for new farmers. While these seasonal and permanent agricultural housing needs are not new, they are particularly acute for new farmers wanting to create local short food chains. ‘One has only to go for a walk to see a number of farms with old buildings and a mobile home, and where in fact the new farmer’s idea was to buy the farm but they live in the

¹⁰ We use here the notion of local short food chains (SFC) because it allows us to understand these agri-chains from the point of view of geographical and/or organised proximity between actors in the food system, and to define their different spatial modalities (shorter distances), functional modalities (contribution to territorial development by involving several actors in the territory), and relational and economic modalities (Praly et al., 2014).

¹¹ State aid is only available for financing new buildings designed by professional equipment manufacturers.



Fig. 7. Development of crop and animal processing units, with a view to achieving independence and adding value. Different processing strategies can be adopted: the collectivisation of tools, mainly in order to raise financial resources and to help each other with tasks (photo 1: crop processing workshop, Lozère); the refurbishment of old farm buildings, in order to limit the amount of land being built on (photo 2: meat processing unit, Ariège); or the design of mobile or prefabricated buildings, as they are more economical and can be dismantled (photo 3: cheese making unit, Ariège). Photo credit: O.R., 2022.



Fig. 8. Production buildings for storage (crops, fodder, tools, etc.), animal stabling and cultivation. Tunnel greenhouses are mainly used for market gardening (photo 1, Ariège), and also sometimes for stabling animals in more progressive farms. The practice of self-construction and the use of wood are also widespread, as shown in photo 2 (pig shed made of wood and reused corrugated steel sheets, Ariège) and photo 3 (3-in-1 building: stabling/storage/milking parlour, Ariège). Buildings can be refurbished also to be used to stable animals, often as a forced choice, while waiting to obtain funds to invest in a new and more functional building (photo 4: traditional sheep pen, Ariège). Photo credit: O.R., 2022.

mobile home [...], in each municipality I count one or two such cases', says an advisor from the Gers CAUE. These new farmers, usually taking to farming outside a family framework, enter the agricultural world with often limited financial means and little or no land and building capital.

Since setting up a farm can be a difficult time, mobile or light housing solutions allow people to live on the farm (Fig. 9), more or less temporarily and more or less in conformity with regulations. This type of accommodation has developed in particular with the increasing involvement in farming projects by WWOOFers, who participate in the farm's agricultural work in exchange for board and lodging.¹² Faced with this phenomenon, the parks and elected officials often resort to mediation by regularising situations or finding compromises. The light and dismant-

lable constructions discussed by the interviewees testify, beyond their material aspect, to an evolution in the ways of living and investing in rural spaces and agriculture. These dwellings, which are less expensive and quicker to obtain and erect than a normal house, could make it easier for new farmers to begin their farming journey. These forms of occupation of space can also prove positive for rural revitalisation. 'It brings in families, sometimes there are children too, so it's good for the school, it's good for the bakery, it's a whole circle', exclaims a project manager. In the Causses du Quercy PNR, several municipalities have already made provision for dedicated zones for light structures in their urban planning documents in order to encourage these types of dwellings.

Initiatives coordinated by territorial authorities exist, in addition to the support already provided by the parks, for example the establishment of a network of collective processing units in Lozère for the past 30 years or the provision of public buildings. Other initiatives are attempting to (re)create farms. In a small rural municipality in Lozère, a

¹² WWOOF CHARTER © FoWO - November 2022. Available online: <https://docs.wwoof.net/wwoof-charter.pdf>



Fig. 9. Example of a free-range pig farm in the process of being set up in an old farmhouse in Hérault. Mobile homes are used by the farmers for accommodation until the construction work is completed. Photo credit: O.R., 2021.

pastoral land association was created by local elected officials to help a couple of young farmers start organic farming. An advisor-architect from the Lozère CAUE clarifies that the farmers were ultimately not able to start livestock farming because of their neighbours' objections: 'It has become a village of second homes and the residents cannot stand the flies and the smell, so now [the farmers] have switched to greenhouses for market gardening'. Finally, there can often be a lack of coordination between the various agricultural advisory bodies. For example, some park managers admitted that they have little or no contact with the Chamber of Agriculture because of political and ideological differences. These disagreements can lead to practices of mutual ignorance. However, this statement is obviously not generally applicable and these situations may arise due to transitory issues.

4. Discussion

4.1. Changes in rural areas

Our observations confirm that the farm-buildings environment is a relevant heuristic object for understanding not only the different trajectories of agricultural and food transitions, but also the bottlenecks these transitions are experiencing. Our territorial approach to the farm-buildings environment hence confirms Van der Vaart's (2005) statement: 'The farm buildings are very good indicators of the change in rural areas. Economical, technical, social and aesthetical changes are expressed in these structures'. For example, in Ariège, the coexistence of semi-industrial cheese dairies and small on-farm production units points to a differentiation between a peasant production ethic and a heritage production ethic (Fiamor et al., 2021). In Lozère, the construction of large cattle sheds could be correlated with the rewilding programme (Knight, 2016).

Based on the actors' statements, 16 major geographical dynamics have been identified that take into account the associated agricultural and food transition trajectories. In most of the Occitania region, interviewees mentioned mixed dynamics, with a dominating trend towards standardization and photovoltaic installations, and a significant renewal of farm buildings leading to a high consumption of land. We tie these dynamics to the agro-industrial model and almost all territories are subject to them, even if they are concentrated in the most productivist rural areas. This trend is not new. Over the 1980–2002 period, farm buildings accounted for 31% of new non-residential building surface areas (Madeline, 2006). Since 1970, there has been an estimated construction of an average of 10 million m² cumulative surface area per year of agricultural buildings (Beaumesnil, 2006). Older farm buildings, whose architecture was closely rooted to the territory, do not fulfil their original function for the most part. At a national scale, only 6 million of the 11 million farm buildings inventoried in 1966 remained in 2006, half of which were not in agricultural use (*ibid.*).

On a smaller scale, interviewees identified dynamics of territorialization of the farm-buildings environment, essentially in territories with strong environmental, heritage and landscape contexts, i.e., the parks and certain wine-growing and high-altitude areas. These dynamics are driven by niche agricultural models that leverage proximity to the territory. For instance, old farm buildings have been refurbished for residential uses or tourism activities in the wine sector, a phenomenon also documented in other Mediterranean countries, such as Spain (Fuentes et al., 2010) and Italy (Torreggiani and Tassinari, 2012). Indeed, the possible reuse of old farm buildings has been a preoccupation for some time; it has already been, for example, the subject of studies in Europe (van der Vaart, 2005; Verhoeve et al., 2012) and New Zealand (Mackay et al., 2019). But these two ideal-typical models of the farm-buildings environment (standardization, territorialization) often coexist in these territories, along with some hybrid models.

A multitude of innovative solutions (mobile, multifunctional, modular or collective buildings) in connection with short food chains were mentioned by the respondents. They are designed in particular to respond to housing issues in the territories. If these solutions were better known and supported, they could constitute sustainable and supportive alternatives due to their dismantlability, low cost, modularity and low consumption of space (Mésini, 2011; Michel, 2016; Nougaredes et al., 2022). It must however be noted that medium and large farms can also implement innovations of this type: in North America, for example, hop producers have developed innovative self-solutions on the farm to become more resilient (Comi, 2023).

Finally, initiatives coordinated by territorial authorities, some of which failed, demonstrate the need for territorial-scale engineering and 'toolboxes' (Fournier et al., 2022) and for regional planning of the farm-buildings environment. Agricultural issues are sometimes better taken into account when urban planning documents are drawn up. For example, the establishment of a communal agricultural hamlet grouping all new farm buildings is described as a sustainable urban planning approach (Nougaredes, 2013).

However, the antagonistic requirements of farm buildings (performance, ergonomics, aesthetics, conformance to regulations, etc.) appear to be difficult to reconcile for farmer entrepreneurs.

4.2. Approaches to farm buildings to meet the challenges of agri-food transitions

We propose to draw from this work several major approaches¹³ to the farm-buildings environment that can meet the challenges produced by transitions (landscape, environment, economy, technical, so-

¹³ By the term approach we mean here a way of conceiving and designing farm buildings.

cial, etc.). These approaches do not make value judgements on the dynamics underway or suggest that there is an implicit model of ‘good development’.

- The *technological approach* to farm buildings: This approach does not confront the current agro-industrial model but relies on technological progress to meet ecological challenges and food needs of a growing world population. The deployment of photovoltaic sheds is an example of this approach. This phenomenon is encouraged by national energy transition policies (Le Velly and Jarrige, 2022). Like methanisation units, photovoltaic sheds enable farmers to diversify their income by producing energy in addition to agricultural products (Anzalone and Mazaud, 2021).
- The *heritage approach* to farm buildings: This approach is based on the repurposing and refurbishment of old buildings. With a focus on marketing, it is often adopted in the agritourism sector and direct sales activities. This strategy is less relevant to agricultural production because these buildings are often too small, not very ergonomic and do not comply with current standards. Furthermore, it can be very expensive to refurbish and renovate them.
- The *ecological approach* to farm buildings: This approach involves the use of ecological and natural resources in order to reduce the buildings’ impact and to take advantage of materials (inertia, recycling, etc.). Like the heritage approach, this approach is limited because it is more expensive and/or requires a certain sensitivity on the part of the farmer concerned. The local and organic agri-food chains are very well represented here because this approach is in line with their desire for environmental preservation. The *frugal approach*, considered to be a sub-approach of the ecological approach, is based on the moderation of energy and material needs, on self-construction and the reuse of materials. Self-construction is quite widespread in peasant agriculture; it helps not only save money but also achieve technological independence (Goulet et al., 2022; Meyer, 2022). This frugal approach is of interest because it is economical, ecological and widely implementable, but it is sometimes frowned upon by the authorities, who are not familiar with the often makeshift constructions. Indeed, these frugal constructions, sometimes resulting from a militant and socially rebellious attitude, can be novel, more ephemeral and ascetic ways of inhabiting the earth (Macé, 2019).
- The *mobile-building approach* (or alternative to buildings, use of mobile buildings): This approach represents an interesting solution to facilitate the sharing and mobility of infrastructure in rural areas. It also limits the permanent soil sealing, does not call for large investments and favours the sharing of sometimes underused infrastructure. Mobile buildings can be used for cheese-making units, fruit presses or slaughterhouses, or even housing (yurts).

4.3. Mapping the dynamics of farm buildings to understand and resolve regional planning issues

The study and mapping of the territorial dynamics of the farm-buildings environment have enabled us to shed light on issues that are crucial for the reterritorialization of agriculture and food production. By combining and juxtaposing different partial points of view of actors, we have proposed an encompassing, updated and situated vision of the major issues of the farm-buildings environment in Occitania. We are aware that this approach involves a degree of subjectivity. In fact, we have graphically represented the space as perceived by the actors, but also designed and drawn the map with the inclusion of internalised knowledge (Cauvin, 1999). Added to this is the choice of actors, which determines the key to reading the map (territorial here). To compensate for this limitation, researchers have developed the notion of uncertainty (Arnaud and Davoine, 2009) and have built a specific graphic language that allows spatial imprecision and incomplete information to be included in graphical representations (Griethe and Schumann, 2006). The downside of this approach is that it makes the graphics more difficult

to understand and affects the readability of the mapped results. For this reason, we have not added uncertainty indices to our map.

5. Conclusions

This territorial approach to farm buildings makes it possible to assess the state of progress of agri-food transitions (Lamine et al., 2019) and contribute more broadly to the field of the geography of transitions (Bermond et al., 2019). In fact, as well as identifying 16 major farm-building dynamics, our study lays out the geographical specificities, the diversity of situations and the territorial conditions of emergence of the different transition trajectories. New farm buildings are being constructed in Occitania, whether they are vast specialized buildings with a standardized industrial morphology, covered with photovoltaic panels, or multifunctional buildings that are part of the revival of local SFCs (market gardening; perfume, aromatic and medicinal plants; mixed cropping; poly-livestock farming). The projects in these agri-chains, undertaken mainly by new farmers, reveal a particular relationship with agriculture, and more broadly with space. The territories of the parks, those at high altitudes or those with strong environmental, heritage and cultural contexts are strongly represented here. These building dynamics reveal not only the coexistence, but above all the confrontation of agricultural models (Gasselin et al., 2023), with two major environmental conceptions of transition: transition through technology, or through reducing the footprint of activities while reorganizing and relocating agri-food systems.

The study shows the need for regional planning of the farm-buildings environment. The role of local authorities in charge of designing and implementing land use zoning plans should be examined in particular in order to help improve the quality of farm buildings. They could, for example, reconcile the variety of approaches to farm buildings (technological approach, heritage approach, ecological approach, frugal approach and mobile building approach), each of which has its advantages, disadvantages and incompatibilities, with a view to an integrated territorial project.

Ethical statement

The research involved human participants and was approved by the Human Research Ethics Committee of the University of Toulouse Jean Jaurès before data collection. The study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments. Informed consent was obtained from all individuals included in this study.

Declaration of Competing Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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