

## **Actions to strengthen the contribution of small farms and small food businesses to food security in Europe**

Moreno-Pérez, Olga M.; Arnalte Mur, Laura; Cerrada-Serra, Pedro ; Martinez-Gomez, Victor; Adamsone-Fiskovica, Anda ; Bjørkhaug, Hilde; Brunori, Gianluca; Czekaj, Marta; Duckett, Dominic ; Hernández, Paola A.; Noble, Christina; Pinto-Correia, Teresa; Płonka, Aleksandra ; Prospero, Paolo; Redman, Mark ; Rivera Mendez, Maria; Šūmane, Sandra; Ortiz Miranda, Dionisio

*Published in:*  
Food Security

*DOI:*  
[10.1007/s12571-023-01421-0](https://doi.org/10.1007/s12571-023-01421-0)

*Publication date:*  
2024

*Document Version*  
Publisher's PDF, also known as Version of record

[Link to publication in ResearchOnline](#)

### *Citation for published version (Harvard):*

Moreno-Pérez, OM, Arnalte Mur, L, Cerrada-Serra, P, Martinez-Gomez, V, Adamsone-Fiskovica, A, Bjørkhaug, H, Brunori, G, Czekaj, M, Duckett, D, Hernández, PA, Noble, C, Pinto-Correia, T, Płonka, A, Prospero, P, Redman, M, Rivera Mendez, M, Šūmane, S & Ortiz Miranda, D 2024, 'Actions to strengthen the contribution of small farms and small food businesses to food security in Europe', *Food Security*, vol. 16, no. 1, pp. 243-259. <https://doi.org/10.1007/s12571-023-01421-0>

### **General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

### **Take down policy**

If you believe that this document breaches copyright please view our takedown policy at <https://edshare.gcu.ac.uk/id/eprint/5179> for details of how to contact us.



# Actions to strengthen the contribution of small farms and small food businesses to food security in Europe

Olga M. Moreno-Pérez<sup>1</sup> · Laura Arnalte-Mur<sup>2</sup> · Pedro Cerrada-Serra<sup>2</sup> · Victor Martinez-Gomez<sup>1</sup> · Anda Adamsonė-Fiskovica<sup>3</sup> · Bjørkhaug<sup>4</sup> · Gianluca Brunori<sup>5</sup> · Marta Czekaj<sup>6</sup> · Dominic Duckett<sup>12</sup> · Paola A. Hernández<sup>8</sup> · Christina Noble<sup>7</sup> · Teresa Pinto-Correia<sup>9</sup> · Aleksandra Płonka<sup>6</sup> · Paolo Prosperi<sup>10,13</sup> · Mark Redman<sup>11</sup> · Maria Rivera<sup>8</sup> · Sandra Šūmane<sup>3</sup> · Dionisio Ortiz-Miranda<sup>1</sup>

Received: 24 January 2022 / Accepted: 13 November 2023  
© The Author(s) 2023

## Abstract

This study stems from a participatory foresight exercise conducted in nine Mediterranean, Baltic, Nordic and Eastern European regions, aiming to strengthen the role of small farms and small food businesses in ensuring food security. A wide range of stakeholders participated by attending workshops. They represented farmers' organisations, food businesses, consumers' organisations, NGOs, researchers, extension services, professional groups, and administration and public bodies. The actions proposed by participants are scanned and categorised around six broad objectives, stakeholders' priorities and their underlying beliefs and preconceptions are discussed around the current debates of the literature, and the drivers that influence the feasibility of the proposed actions are discussed. Furthermore, the alignment of stakeholders' -driven objectives with the European Strategies on food, agriculture, and rural areas is examined, with a focus on: (i) the EU Farm to Fork Strategy, (ii) the Rural Action Plan contained in the Long-Term Vision of Rural Areas developed by the EU Commission, and (iii) the Common Agricultural Policy in force since January 2023.

**Keywords** Food security · Europe · Small farms · Small food businesses · Backcasting planning · Common agricultural policy

## 1 Introduction

The definition of small farms has been widely debated in the academic literature (Davidova & Thomson, 2014). Thresholds of farm land size are commonly used to distinguish small farms from the others. In Europe, using this metric, small farms are generally defined as those measuring less than five hectares of utilised agricultural land. According to this definition, over 10 million European Union farms –approximately 70% of all holdings - are small farms, and two out of three operate less than two hectares (European Parliament Research Service, 2022).

The importance of small farms regarding the alleviation of rural poverty and depopulation, as well as the provision of environmental goods, has been addressed in the European literature (Guth et al., 2022; Shucksmith & Rønningen, 2011). Studies have also shed light on the contribution of small farms to food security, which goes beyond food self-provisioning (Guarín et al., 2020; Guiomar et al., 2018). In

some European regions and for some product categories, small farms provide more than half of the produce (Rivera et al., 2020). Moreover, small farms have been found to be connected to the regional food systems in formal and informal ways that are sometimes distinct from those of bigger farms. Thus, small farms have a role in diversifying food systems and improving consumer access to fresh and diverse food (Galli et al., 2020). Meanwhile, small food businesses have the potential to add value to small farms' activities, by means of processing, retailing, and distributing small farm foodstuffs (Hernández et al., 2021).

Despite their importance, the statistical data show that the number of small farms has been declining in Europe over time. Between 2005 and 2016, 38% of the farms with less than two hectares disappeared in EU-28. About 85% of the farms that disappeared had less than 5 ha, whereas the number of farms with 100 ha or more increased by 18% (Eurostat, 2018).

Against this background, this study stems from a participatory foresight exercise conducted in nine European regions, aiming to strengthen the role of small farms and

Extended author information available on the last page of the article

small food businesses in ensuring food security. A wide range of stakeholders participated by attending workshops. They represented farmers and farmers' organisations, food businesses (input suppliers, processors, retailers, supermarkets), local action groups, consumers' organisations, NGOs, scientists and researchers, extension services, professional groups (consultants, vets), and administration and public bodies (policy-makers and officials from agriculture, development, sanitary and epidemiological departments).

The research objective of his paper is fourfold: (i) to scan and categorise the actions proposed by the stakeholders, (ii) to discuss the drivers that influence the feasibility of the stakeholders' proposals, (iii) to unpack the beliefs or preconceived ideas regarding how small farms contribute to food security that underlie the stakeholders' proposed actions, and (iv) to analyse to what extent the provisions of the current EU policy framework on food and agriculture align with the recommendations derived from the workshops.

The contribution herein aligns with the growing impact of participatory foresight exercises on scholars and policy-makers over the last two decades in various domains, including agriculture and food systems (OECD, 2020; Barrett et al., 2021) attributable, in part, to a legitimacy-seeking shift in governance approaches (Duckett et al., 2017). This article is distinct and novel in several key aspects. Firstly, it has an empirical foundation with a wide social and geographical coverage, which includes the participation of nine (Nordic, Mediterranean, Baltic and Eastern European) countries and 130 stakeholders. Secondly, it introduces a unique normative and action-oriented approach on how to enhance the contribution of small farms and small food businesses to food security, setting it apart from a previous exploratory foresight study on this topic (Ortiz-Miranda et al., 2022). Thirdly, it bridges the gap between academia and the perspective of grass-root actors by not only capturing stakeholders' insights, but also by contrasting them with the evidence found in scientific studies. Fourthly, it allows for an assessment of the alignment or divergence between the stakeholders' perspectives and the existing policy framework.

The next section details the steps followed to conduct this study. Sections 3, 4 and 5 detail Results, Discussion and Conclusions.

## 2 Methods

The exercise presented here follows a methodology that combines prospective, planning, and participative approaches, commonly referred to in the foresight literature as “backcasting”, which consists of “*generating a desirable future, and then looking backwards from that future to the present in order to strategize and to plan how it could be*

*achieved*” (Vergragt & Quist, 2011: 747). A distinct element of backcasting as a foresight method lies in the normative, as opposed to predictive, nature of the scenarios that are taken as endpoints for planning (Sonia-Lara & Banister, 2017).

The steps of the methodology followed to conduct this analysis are explained below and synthesised in Fig. 1.

Step 1 comprises the steps necessary to prepare the regional workshops. A training day was held in order to acquaint the facilitators of the regional teams with the intended workshop dynamics, and a draft protocol was also outlined. This draft was elaborated and fine-tuned in the weeks prior to the workshops

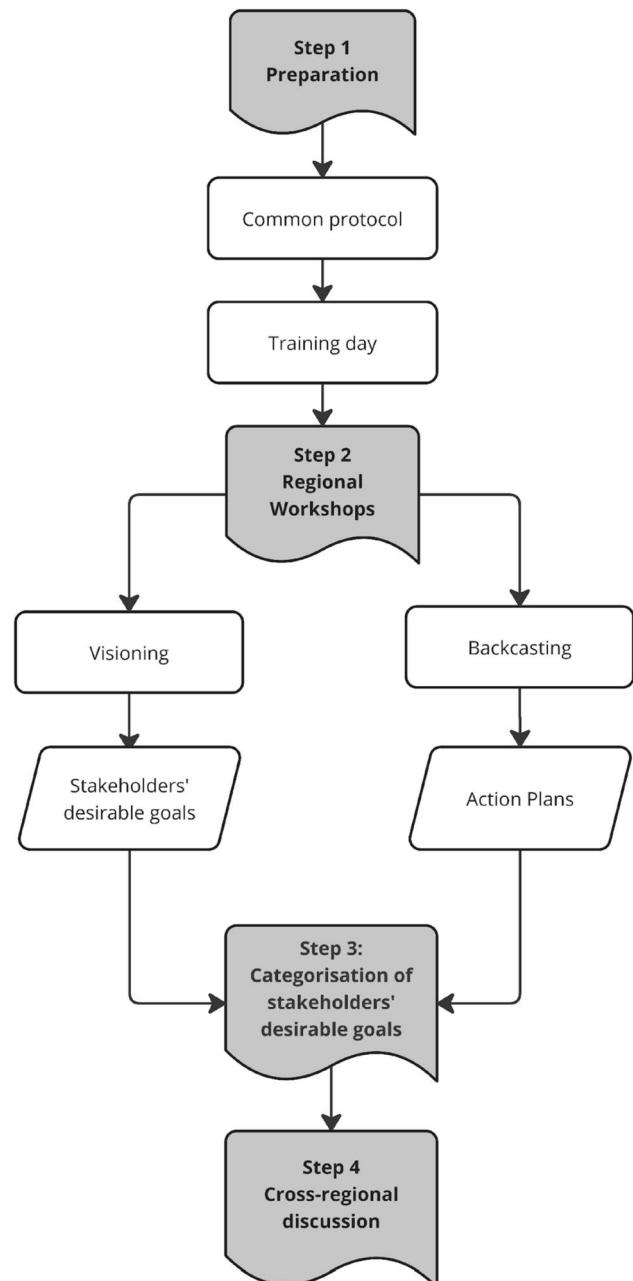


Fig. 1 Steps taken in the analysis. Source: Authors' elaboration

**Table 1** Regions and number of participants and facilitators of the foresight workshops

Country	Region	Date of the workshop	No. participants (women)	No. facilitators (women)
Spain (ES)	Castellón	20 November 2018	16 (8)	6 (1)
Italy (IT)	Pisa	20 December 2018	7 (1)	4 (2)
United Kingdom (UK)	Perth and Kinross, and Stirling	30 January 2019	19 (10)	7 (5)
Poland (PL)	Rzeszowski	27 February 2019	24 (9)	6 (5)
Latvia (LV)	Latgale	1 March 2019	20 (13)	4 (2)
Norway (NO)	Hedmark	6 March 2019	5 (1)	4 (3)
Greece (GR)	Larisa	7 March 2019	13 (5)	4 (1)
Portugal (PT)	Oeste	7 March 2019	12 (9)	5 (5)
Romania (RO)	Giurgiu	12 March 2019	14 (7)	4 (4)

Source: Authors' elaboration

to take into account the specificities of each region, while keeping a common methodological core to facilitate the comparative analysis. In step 2, one-day regional participatory workshops were conducted in nine European regions (Table 1). The participants were selected and invited by each research team, pursuing a diversity of profiles pertinent to the study.

In the workshops, participants were asked about the role that they *would like* small farms and small food businesses to play both in terms of their contribution to the production of food in the region, and to their provision of an adequate diet to consumers and farm households. This stage was carried out using cognitive maps, which can usefully systematise the understanding of concepts and issues (Van Berbel & Verburg, 2012). The members of each group were given sticky notes to write their 'visions' or desirable aims for the future, and were encouraged to react to each other's ideas. The sticky notes were arranged thematically on flip charts in such a way that each cluster represented a broad aim. The participants were then asked to select up to three of these aims through a voting system.

Later, each group developed an action plan to achieve the selected aims, and arranged the actions that should be taken in a reverse chronological order, from 2030 to present. The facilitators assisted the process by means of verbal prompts and questions. As an outcome of the workshops, 25 action plans were formulated across the nine European regions designed to achieve the 41 aims selected by the stakeholders.

These aims were formulated with different degrees of precision – from very specific to far-reaching goals. In step 3, an inductive identification of thematic patterns by means of colour codes allowed for the re-arrangement of the 41 aims defined at a regional level into six broad objectives at a European level. These second-tier objectives were formulated ensuring that they (i) covered the vast majority of the regional aims, (ii) closely related regional aims were grouped together under the same broad objective, and (iii) encompassed various avenues that had been identified through which the contribution of farms and small food businesses to food security could be enhanced.

Step 4 consisted of a synthesis of the *actions* proposed in all the regions to achieve each one of the six broad objectives. This phase constituted a challenge, given the amount of information collected and the unavoidable overlaps between the actions proposed in the nine regions. In order to deal with this complexity, first, every action was assigned to one of the six objectives identified in the preceding stage, and second, similar actions proposed in different regions were consolidated. Importantly, we kept the traceability of the region/s that proposed each action and context-specific nuances of interest. Finally, a cross-regional discussion of the broad objectives and the proposed actions was addressed by the research team.

### 3 Results

Table 2 shows the number of aims that the stakeholders prioritised in the regional workshops, as well as the number of actions that they proposed to reach them.

**Table 2** Number of desirable goals and proposed actions per region

Region	Number of regional aims	Number of proposed actions
Larisa (GR)	5	42
Pisa (IT)	1	13
Latgale (LV)	6	52
Hedmark (NO)	6	31
Rzeszowski (PL)	3	34
Oeste (PT)	4	66
Castellón (ES)	5	45
Giurgiu (RO)	5	36
Perth and Kinross, and Stirling (UK)	6	41
Total	41	360

Source: Own elaboration

These six objectives, and a synthesis of the actions proposed by the stakeholders to achieve them, are detailed below. The regions that proposed each action are also abbreviated in parentheses, for example ‘ES’ for Spain (see the countries’ abbreviations in Table 1).

### **3.1 Objective 1: Small farms and small food businesses have knowledge and access to capital, inputs, and innovations**

Many of the actions aimed at achieving this objective were focused on the access to knowledge by small farms and small food businesses. The workshop participants proposed measures such as training courses and advisory services, aimed at the acquisition of the know-how needed to produce local/traditional/healthy food (ES, PL, NO, LV), to improve marketing, and to enable multi-actor network building (GR, NO, LV). Peer-to-peer learning and field visits were also proposed (PT, GR, PL, LV). In RO, emphasis was placed on taking advantage of the experience and knowledge of returning migrants.

Only stakeholders in NO highlighted the importance of public support in financing the restructuring of small farm production systems to achieve the goal of transforming them into pioneers of healthy food production. The implementation of precision agriculture by small farms was proposed in GR. Stakeholders of several countries suggested creating joint selling platforms for local agri-food production (ES, PL, IT, LV), or platforms for information and experience sharing (GR).

An aspiration for the improvement of regional and rural infrastructure was evident. The UK’s participants advocated the creation of regional food hubs, support for digital channels and high-speed broadband provision. In RO and LV, the importance of better connected rural spaces and services to encourage repopulation of rural areas was underlined.

Stakeholders in two countries desired actions aimed at increasing the access to land. In the UK, the country with the largest farms in Western Europe, reforms to increase the access to small scale plots of land were proposed. In LV, participants suggested free access to a public database on non-farmed land plots, and that the State could buy strips of land that have become a burden for large, intensified farms and lease them to small farms.

Finally, the access to credit for small farms and small food businesses – as a requirement to invest in inputs or technology – was only mentioned in LV and PL, with reference to credit lines, credit unions, preferential loans, and state guarantees.

### **3.2 Objective 2: Small farms and small food businesses participate in and have access to value-addition processes and new business models**

To achieve this objective, co-participation of farmers, consumers, and other stakeholders in the discussion of

food-related issues and the development of new business models were seen as necessary (ES, LV, RO).

The creation of business incubators (ES), the support for start-ups in rural areas (RO), and the launch of support programmes for enthusiasts (NO) were also proposed. Stakeholders stated that cooperatives would need public support targeted to professionalise their staff in order to make informed market decisions (ES). Likewise, the public administrations and research institutions were nominated to carry out market studies to identify consumers’ preferences for small food businesses (PT).

Stakeholders in nearly all countries considered product labelling for quality, local provenance, nutrition, and organic products as a key value-adding strategy for small farms’ and small food businesses’ products. The creation of public or private provenance mechanisms for certification of local products (GR, UK, PT, IT, RO, NO, LV), their effective protection against counterfeiting (GR), the creation of specific brands for small farm products (RO) and public support to Denominations of Origin (PT), also featured in the discussions.

### **3.3 Objective 3: Small farms and small food businesses have a significant share of the regional food supply and are well connected to diverse markets**

Workshop participants highlighted the need for increasing the accessibility of consumers to products from small farms and small food businesses through diverse distribution channels. Their proposals focused on the commercialisation of high quality products in short supply chains. For instance, they advocated for the creation of small shops for specialty or local food (GR, UK, PL). Support to farmers’ markets was also requested (NO, ES, UK, LV), and suggestions were made to boost new online distribution channels (RO, PL) and food vending machines in local communities (UK). Improving the access of small farm and small food business products to supermarkets was considered only in LV.

Tourists, in a number of the discussions, were recognised as potential consumers; in this sense, there was a perceived need to enhance collaboration between small farms, small food businesses and tourist agencies, as well as to develop marketing strategies targeted at tourists (UK, ES, PT, IT). The creation of hubs to foster contacts between small food production units and hotels and restaurants was also advocated (ES).

### **3.4 Objective 4: Food culture in the region has changed towards greater consumer awareness and appreciation of local small farms’ and small food businesses’ products**

This objective embraces the demand-side actions aimed at influencing the consumers’ mind-set, so that they privilege the consumption of food produced by local small farms and

small food businesses. To achieve this goal, public awareness campaigns were proposed in all the regions, focused on spreading the consumption of local food (GR, ES, IT, PL, RO, UK, LV), promoting niche products with high value added (PT, RO), traditional products of the local cuisine (ES, PT, GR, IT) or traditional crops and varieties (PT). Campaigns and life-long education in purchasing responsibility (i.e. understanding seasonality, strengthening the link between environmental values and food) were also considered desirable (PT, UK, LV), along with education on healthy and nutritious diets (PT, IT, PL, UK, LV) and training in individual cooking skills (LV). In most countries, several of these messages were seen as integral parts of a joined up campaign. Education at school received attention in most of the countries (ES, UK, PT, PL, LV, IT).

Measures specifically aimed at raising public awareness about the role of small farms also emerged in the discussions (ES, PT, RO, LV). For instance, in PT, small farms were encouraged to promote their products on the local radio and TV. In LV, marketing campaigns (e.g. open farm days) and ICT tools to inform consumers about small farm products were considered, along with the promotion of small food businesses' participation in regional and national food fairs.

### **3.5 Objective 5: Small farms and small food businesses are politically, economically, and socially empowered**

This goal gathered the greatest number of proposals, which can be categorised into two groups: those that refer to empowering of small farms and small food businesses through public policies, and those aiming to improve their position in the value chain.

As for the first group, proposals aligned with different policy scales. Actions recommended at the European and national level aimed to provide additional support from agricultural policies to small farmers (PL, RO) and small food businesses (UK) to prevent their marginalisation and acknowledge their role in guaranteeing food security, rural livelihoods, and sustainable regional development (LV, IT). The reduction of the minimum farm size to have access to subsidies was suggested by some countries (GR, NO, PL). In PT, participants recommended reviewing the eligibility criteria based on objectives defined by small farms. Some other proposals went further and asked for minimum food prices at regional level (PT) or for a change of the support schemes from growth to economic stability (NO).

At a national level, changes in the tax policies to incentivise small farms and small food businesses were put forward (PT, LV, GR). Reduced tax for small farms and increased tax for unfarmed land were discussed in LV. Legal requirements around traceability and hygiene could be improved if tailored to the specificities of small farms and small food

businesses (ES, LV). Nearly all regions proposed actions to make public administrations more aware of the importance of small farms and small food businesses in order to prioritise them in public procurement procedures (ES, PT, RO, PL, GR, LV, IT). Municipalities were also called upon to subsidise cooperatives' managers, support the development of infrastructure, and improve logistics, thereby enabling trade and access to larger contracts for small farms (LV, IT).

As a general requirement for achieving these changes, the stakeholders assumed that the small farmers and small food businesses should lobby harder to represent their interests. Multi-actor advocacy of small farms/small food businesses' contributions to food security was deemed necessary (LV, IT). Municipalities should be lobbied to coordinate and support short food supply chains, and regional policy-makers should be encouraged to change rural development programmes in favour of small farms (PT, LV, IT).

The second group of actions is focused on private-led initiatives to improve the position of small farms and small food businesses in the value chain. Value chain arrangements (contracts) at regional and national level were proposed (IT), as well as the creation of second-level cooperatives (ES), the promotion of cooperatives involving small farms and small food businesses (PT), and networking among different small food businesses to create food clusters (GR, LV).

### **3.6 Objective 6: Small farms and small food businesses contribute to environmental protection and climate change adaptation through sustainable production, diversification, and preservation of the genetic heritage**

The most outstanding actions proposed pertaining to this objective were focused on the use of native livestock breeds and traditional varieties and crops, and the preservation of the genetic heritage by small farms (ES, PL, PT, GR). PT's stakeholders emphasised the importance of utilising varieties adapted to the region and climate, drawing on the accumulated knowledge of small farmers. The creation of a Propagation Material Deposit with traditional varieties was proposed in GR. The preservation of native genetic heritage was recognised as a valuable tool to support small farms in achieving those objectives (PL).

Attention was also paid to the need for promoting organic production (GR, UK, LV, IT) and the other environmental certifications for small farms and small food businesses' products (LV). Stakeholders in PT were in favour of reducing small farms' production costs by using farm organic residues and more renewable sources of energy, and surveying relevant bodies about the availability of raw materials in the region to foresee how by-products can be used by small food businesses to create value-added products.



Payments to small farms for their environmental services were also discussed. Subsidy regimes would be compelled to increase the subsidies for environmental services (UK, RO) - a support that could be replaced by or complemented with private schemes (PT, ES).

## 4 Discussion

### 4.1 Exploring stakeholder preconceptions

Generally, the actions aimed at gaining access to technology and inputs (Objective 1) were mainly focused on the access to knowledge and technology to facilitate networking. This aligns with the assumption that networking, as well as the development of value-based supply chains, are knowledge-intensive (Šūmane et al., 2018; Žmija et al., 2020). Digital technologies have the potential to enhance market access for smallholders, lower certification costs and streamline transactions. However, concerns have also been raised about the inclusiveness of such technologies and the changes they may bring to power relations within value chains (Kos & Kloppenburg, 2019). Comparatively, much less attention was paid to the access to inputs, land or finance that is also part of the Objective 1 - credit access being only mentioned in two Eastern European countries, where financial constraints for small farm investments are particularly important (Bjonec & Ferto, 2016; Varga, 2016).

The value addition and the creation of new business models (Objective 2) allow connecting small farms and small food businesses with the changing consumer food preferences. In this vein, the workshop participants strongly recommended food labelling, assuming that this would be an effective strategy of differentiation for the produce of small food production units. However, some studies (Krzysztofowicz et al., 2020) foresee that agricultural corporations will continue targeting the market demand of labelled food by relying on timely supply of low-cost ingredients of standardised quality and vertical integration strategies that may exclude small farms.

Great importance was given by the participants to demand-side actions aimed at influencing consumer food choices in favour of local products (Objective 4). Notably, the concepts of local, high-quality, healthy (nutritious), and sustainable products were frequently intermingled in the stakeholders' discourse without a substantive discussion on whether or to the extent to which these terms are interconnected. Thus, the goods produced by small farms and small food businesses were widely – and, to some point, uncritically - associated with all these attributes. Scholars have also found that consumers connect local food with the mentioned positive characteristics (Szegeđyné Fricz et al., 2020). However, the actual linkage between the local products and

those benefits is extensively problematised in the literature (Karasmanaki et al., 2020; Parker et al., 2016).

Remarkably, actions focused on finding technological solutions or inputs (Objective 1) to increase overall production volume or to improve land or labour productivity in small farms were virtually absent. The need for some degree of land consolidation in areas with an extremely fragmented farm structure (i.e., numerous and very small plots per farm) to ease agricultural operations was largely neglected. This suggests that the actions proposed by the stakeholders to enhance the role of small farms in food security move away from a “productivist” approach. This view overlooks the need to overcome land fragmentation to enhance productivity (Looga et al., 2018), the technologisation as one possible resilience strategy for small farms in some Eastern European countries (Czekaj et al., 2020), and, in broader terms, the prevalence of “productivism”, “sustainable productivism” or “sustainable intensification” in regions where small farms prevail (Galiano, 2017; Juntti & Downward, 2017; Moreno-Pérez, 2013).

Stakeholders' proposals regarding changes in agricultural practices were primarily focused on ensuring that small farms fulfil environmental functions that are expected from them (Objective 6), such as biodiversity conservation, preservation of traditional varieties, and the promotion of organic production. This aligns with existing literature (Płonka, 2019), and with evolving consumer food preference patterns. In broader terms, small farms were perceived in the workshops as integral to a system of synergies contributing to circular economies. However, actions aimed at adapting to climate change received much less attention compared with other environmental issues.

Linked to the above considerations, actions targeted at increasing the presence of small farms or small food businesses' products in mainstream marketing channels (e.g. supermarkets), which could result in a quantitative increase in their sales, were absent in the workshop discussions. The proposals aimed at achieving Objective 5 – empowerment of small farms and small food businesses – revolved around defending their interests in the political sphere rather strengthening their bargaining power within conventional food chains. In line with some scholars' discussions (Hernández et al., 2021; Rivera et al., 2020; Wiggins et al., 2010), the demands of big food retailers in terms of quality standards, prices and purchase volumes, pose a particularly difficult challenge for small farms and small food businesses, a fact that was widely acknowledged in the workshops. Arguably, the strong emphasis made by the stakeholders on the need for political empowerment of small farms/small food businesses responds to the primary goal, on which the rest of the objectives depend, of increasing the public support to small food production units in order to ensure their survival.

According to the above, enhancing the role of small farms and small food businesses in the regional food security in terms of market share (Objective 3) would rely on the multiplication of market niches through alternative food networks. A study has stressed the role of these networks in shaping more sustainable and equitable food systems (Cerrada-Serra et al., 2018), highlighting issues that may also underlie the priorities expressed by stakeholders. The extent to which short food supply chains are gaining ground over conventional chains has long been a matter of debate. Cicatiello (2020) states that the market share of alternative food networks remains small in comparison with conventional chains, although it has experienced an impressive growth. Saviolidis et al. (2020) details scepticism in European stakeholders' views regarding the potential of mainstreaming and upscaling short food value chain initiatives. In a study of seven European countries, Marsden (2017) found that short chains have expanded significantly since late 1990s, but also that these practices are taken up mainly by medium-sized farm businesses, as *"a minimum production level is often necessary to make the activity viable and finance investments, while large volumes are sometimes at odds with the specific and differentiated processing and marketing structures involved"* (p. 138).

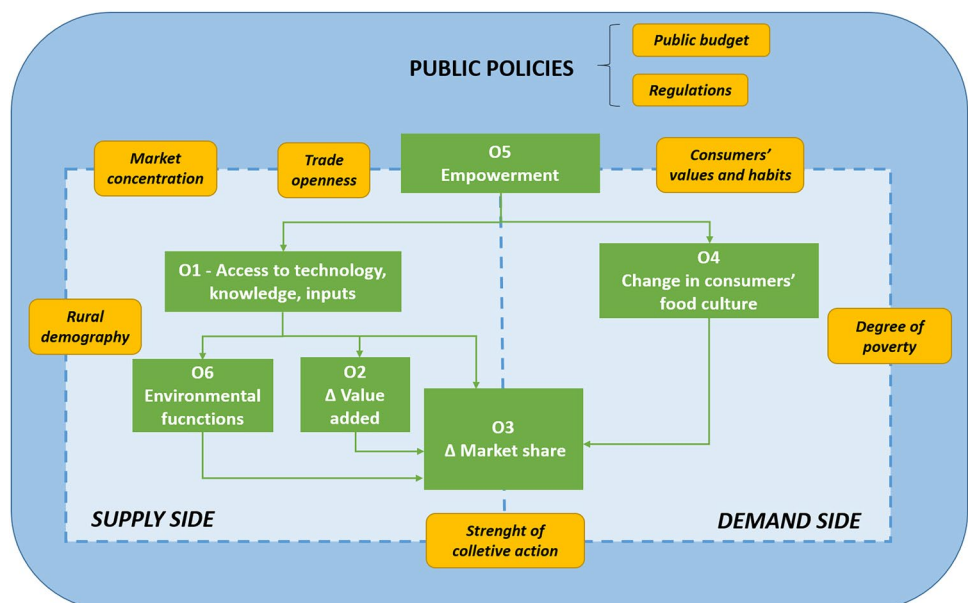
Interestingly, post-Covid-19 literature backs up some of the proposals made by the participants, but also sheds light on new issues. The pandemic has directly undermined food security by disrupting food systems, and indirectly affected it through the impact of lockdowns on household income and physical access to food (Devereux et al., 2020; Duckett et al., 2021). The need for the *territorialisation* of food production and consumption to avoid disruptions in conventional food supplies have been

acknowledged (Hobbs, 2020; Altieri & Nicholls, 2020). The central role of network building to connect farmers, consumers, local markets and small shops in order to increase local food systems' resilience has been made evident during the Covid-19 outbreak. Darnhofer (2020) argues that small farms and small food businesses in Europe reacted fast and like never before in creating such connections. Other authors concur, but also warn about small farms and small food businesses' shortcomings. Hobbs (2020) claims that price and convenience continue to be influential drivers of consumer choice, which places local food supply chains at a disadvantage compared to mainstream chains. Sanderson Bellamy et al. (2021) hold that, should the increase in the demand for fruit and vegetables experienced during the pandemic persist, small farms would require to invest in upscaling their production – something that received little attention by the stakeholders participating in our study.

#### 4.2 Mapping the objectives and the drivers that influence their feasibility

The success or failure of the actions proposed by the stakeholders to achieve the six broad objectives depends on many factors. We will discuss some of these factors drawing from the work of Arnalte-Mur et al. (2020), who identified a number of 'drivers' that influence the role that small farms and small food businesses play in the European food security. The Fig. 2 interconnects the six objectives, and also includes the drivers affecting the feasibility of the actions wherever they may exert such influence.<sup>1</sup>

**Fig. 2** Objectives and drivers for the contribution of small farms and small food businesses to food security. O1 to O6: Objective 1 to Objective 6. SFs: Small farms. SFBs: Small food businesses. Source: Authors' elaboration



<sup>1</sup> For the sake of clarity, interconnections among drivers and between drivers and objectives do not appear in the figure.



As shown in the Fig. 2, three of the objectives seek to act on the supply side. Objective 1 (access to technology, knowledge, inputs and innovations) is instrumental to unlock the achievement of other objectives, such as Objectives 2 and 6. On the demand side, Objective 4 focuses on raising consumers' awareness. Objectives on the demand and supply side converge in Objective 3, which aims to increase the market share of small food producers in the regional supply through diverse channels. Arguably, the empowerment of small farms and small food businesses (Objective 5) contributes to the achievement of all other objectives, since it strengthens their position both in the institutional sphere and in the food value chain – hence its placement in the interface of both domains.

Public policies cover the whole figure, as the *public budget* and the *regulations* are drivers that may enable or constrain the accomplishment of all the objectives, and also influence the way in which the other drivers act. Actions that largely rely on *public budget availability* or should be directly led by the public administration (e.g. the improvement of regional and rural infrastructure) are less likely to occur under increased budget constraints. However, some actions could be carried out even in such a context, as they can be promoted by private actors – e.g. private-led payments for ecosystem services to small farms. As Moragues-Faus et al. (2017) argue, the private sector can play a relevant role in the scalability of food policies at the regional level, for example through civil society organisations affecting consumer food literacy and innovation by small farmers.

Neoliberal, *open-trade market economies* generally are not compatible with some of the proposed actions, such as the establishment of minimum food prices Sodano (2012). However, marketing campaigns aimed at changing consumers' food culture would be feasible. On the other hand, in a context of high *market concentration*, there is a risk that many of the innovative business models that small farms and small food businesses may adopt can be appropriated by large agri-food businesses. This topic connects to the debates on the conventionalisation of organic agriculture (Buck et al., 1997), the conventionalisation of local food (Mount & Smithers, 2014), and the adoption of the discourse advocating for local agriculture by mainstream actors (Lamine et al., 2019). Big operators are also likely to lobby against small farms and small food businesses (e.g., by pushing for “only we feed the world”). However, value chain regulations aimed at empowering small operators may counteract these trends.

As for the *rural demographic trends*, the problem of ageing and lack of family succession of European small farmers (Žmija et al., 2020) would act as a major obstacle for the feasibility of the actions proposed around all the objectives. However, there are also studies that highlight the role that new entrants and young farmers may play in taking advantage of new business opportunities. Policies that support new farmers would address the problem of farms' succession and facilitate the entry of new ideas (Pindado et al., 2018; Milone & Ventura, 2019).

Another danger lies in consumers' access to alternative food markets which could be jeopardised by high levels of *poverty* (Hodgins & Fraser, 2018). An impoverished population is expected to be mainly concerned about income shortages and care little for marketing narratives about the story behind food products; additionally, consumers' perceptions of quality labels are income-dependent (Kaczorowska et al., 2021). Redistributive and minimum income tax policies would directly affect this driver.

The *strength of collective action* would play a critical role in facilitating the implementation of many proposals. First, it would enable the creation of a form of small farms' or small food businesses' representation that would increase their influence in policy consultation mechanisms at local, national and EU level. Furthermore, it would be crucial in overcoming the limitations of small-scale farming (Arnalte-Mur et al., 2020; García Álvarez-Coque et al., 2021). As discussed by Sutherland et al. (2017) and Noble et al. (2023), social capital enables smallholders to engage in different types of networks to access different types of knowledge; multi-stakeholder action is also required to develop certification schemes (De Rosa et al., 2017) or farmer-to-farmer learning on sustainable practices. Balancing the power within the food system also requires strong willingness to cooperate by small farms/small food businesses (Sanderson Bellamy et al., 2021). However, the risks involved in lobbying actions should not be ignored, as not all small farms may be represented in their organisations; the inclusiveness of cooperatives is also contested (Bijman & Wijers, 2019).

Finally, the *consumer values*, including their awareness about health and the environmental implications of their diets, as well as the social recognition of small-scale farming, can have a great influence on the acceptability of public policies – which, in turn, will ultimately determine public budget availability and regulations. On the other hand, if strong social values in terms of solidarity are present, they could counterbalance, to some point, low income constraints and facilitate the promotion of small farms' and small food businesses' produce. Post-pandemic literature has highlighted the desire of small farms to be part of food poverty responses (Sanderson Bellamy et al., 2021). Moreover, even in the most unfavourable context of low income and social cohesion, a minority of small farms could still work together as the need to overcome poverty would act as a trigger (Jentoft et al., 2018; Schneider & Niederle, 2010).

### 4.3 Alignment of the stakeholders' proposals with the European strategies on food, agriculture and rural areas

Small farms and small food businesses have received particular attention in the recent European strategies and policies around food, agriculture and rural areas. We aim to discuss in this section the extent to which the

**Table 3** Alignment of the objectives derived from the workshops, the Farm to Fork proposals, the Rural Action Plan and the new Common Agricultural Policy (CAP) for Small Farms and Small Food Businesses\*

	Farm to Fork Strategy proposals	Rural Action Plan flagship initiatives/actions	Regulation of CAP Strategic Plans (European Parliament, 2021)
Objective 1: Small farms and small food businesses have knowledge and access to capital, inputs, and innovations	<ul style="list-style-type: none"> <li>• Access to fast broadband internet in rural areas</li> <li>• Precision farming, artificial intelligence, satellite technology</li> <li>• Tailored advisory services on sustainable management choices</li> <li>• Effective Agricultural Knowledge and Innovation Systems (AKIS), involving all food chain actors</li> <li>• <i>Access to finance for investments by SME and 'mid-cap' companies</i></li> </ul>	<ul style="list-style-type: none"> <li>• Research and innovation for rural communities</li> <li>• <i>Actions, including research and innovation funding activities -paying special attention to small and medium sized enterprises</i></li> <li>• 'Rural digital futures'. 100% fast broadband coverage in rural areas by 2025.</li> <li>• Networking between rural businesses through the European Enterprise Networks</li> </ul>	<ul style="list-style-type: none"> <li>• Farm advisory services adapted to the various types of production and farms (art. 15)</li> <li>• Access to knowledge required to implement environmental, climate-related and other management commitments (art. 70.9)</li> <li>• Knowledge exchange and dissemination of information (art. 78)</li> <li>• Support for investments (art. 73)</li> <li>• Setting-up of young farmers/new farmers and rural business start-up (art. 75)</li> <li>• Cooperation to implement smart-village strategies (art. 77)</li> </ul>
Objective 2: Small farms and small food businesses participate in and have access to value-addition processes and new business models	<ul style="list-style-type: none"> <li>• "New green business models" for farmers and cooperatives</li> <li>• Harmonised mandatory front-of-pack nutrition labelling</li> <li>• Requirement of the origin indication for certain products</li> <li>• Sustainable labelling framework covering nutritional, climate, environmental and social aspects of food</li> <li>• Strengthening of the legislative framework on Geographical Indications</li> </ul>	<ul style="list-style-type: none"> <li>• Promotion of geographical indications</li> <li>• Provision of opportunities to innovative business practices, cooperate and cluster as well as develop new sectors of the economy</li> </ul>	<ul style="list-style-type: none"> <li>• Cooperation to promote and support quality schemes and their use by farmers (art. 77)</li> </ul>
Objective 3: Small farms and small food businesses have a significant share of the regional food supply and are well connected to diverse markets	<ul style="list-style-type: none"> <li>• Reduction of long-haul transportation to create shorter food chains</li> <li>• <i>Support to small-scale farmers in meeting safety and sustainability standards and in accessing markets</i></li> </ul>		
Objective 4: Food culture in the region has changed towards greater consumer awareness and appreciation of local small farms/small food businesses products	<ul style="list-style-type: none"> <li>• Sustainable food labelling framework to empower consumers to make informed, healthy and sustainable food choices</li> <li>• Review of the EU promotion for agricultural products to enhance its contribution to sustainable production/consumption</li> </ul>		
Objective 5: Small farms and small food businesses are politically, economically, and socially empowered	<ul style="list-style-type: none"> <li>• <i>Tailored solutions to help SME food processors and small retail and food service operators to develop new skills and business models, avoiding additional administrative/cost burdens</i></li> <li>• Minimum mandatory criteria for sustainable food procurement to promote healthy and sustainable diets, including organic food</li> </ul>		<ul style="list-style-type: none"> <li>• <i>Payment to small farmers by way of a lump sum or of amounts per ha replacing direct payments. The annual payment per farmer shall not exceed € 1250. (art. 28)</i></li> <li>• <i>Redistribution of 10% of income support from larger to smaller or medium-sized holdings (art. 29)</i></li> <li>• <i>Support to producer groups or inter-branch organisations (art. 77)</i></li> </ul>

Table 3 (continued)

	Farm to Fork Strategy proposals	Rural Action Plan flagship initiatives/actions	Regulation of CAP Strategic Plans (European Parliament, 2021)
Objective 6: Small farms and small food businesses contribute to environmental protection and climate change	<ul style="list-style-type: none"> <li>• Reversion of biodiversity loss</li> <li>• Reduction of pesticides, antimicrobials and fertilizers</li> <li>• Promotion of organic farming</li> <li>• Promotion and scaling-up of circular business models in food processing and retail, <i>including specifically for SMEs</i></li> </ul>	<ul style="list-style-type: none"> <li>• Support rural municipalities in energy transition and fighting climate change</li> <li>• Climate action in peatland through carbon farming</li> <li>• EU Mission on soil health and food</li> </ul>	<ul style="list-style-type: none"> <li>• “Eco-schemes” (art. 31)</li> <li>• Environmental, climate and other management commitments (art. 65)</li> <li>• <i>Collective environmental schemes (art. 70.5)</i></li> </ul>

\*In italics, actions specifically targeted or suited to small food producers

Source: Authors' elaboration

contemporary European political framework aligns with the six objectives identified from the stakeholders' prioritised aims. Table 3 shows the correspondence of these objectives with: (i) the Farm to Fork strategy (European Commission, 2020), (ii) the Rural Action Plan of the Long-Term Vision for the EU's Rural Areas (European Commission, 2021), and (iii) the new Common Agricultural Policy (European Parliament, 2021).

The Farm to Fork Strategy proposes actions that would address the six objectives, although most of them are targeted to all food chain actors, and only a few (highlighted in italics) pay specific attention to small-sized producers. Among the three policy documents analysed, this Strategy is the only one that directly addresses the consumer side (Objective 4). For instance, in the EU Code of conduct for responsible business and marketing practice, one of the first deliverables of the Farm to Fork Strategy provides guidelines for the promotion of healthy, sustainable diets, and environmentally responsible food, and sets out to inform citizens about the real costs of food. Sustainable food labelling is also conceived to empower consumers.

The Long-Term Vision for the EU's Rural Areas pays attention to agri-food activities and acknowledges the need for shortening food supply chains, improving the value addition of farmers, developing labelling schemes and satisfying the increasing demand for local products. The Rural Action Plan, articulated around flagship initiatives, aligns with the majority of the six objectives we have discussed here, but the scope of the actions is broader as they are aimed at covering the different sectors and needs of the rural areas, and little consideration is paid to small farms and small food businesses.

The treatment of the new Common Agricultural Policy to small farms deserves special attention, as €386.6 billion are earmarked to this policy. Remarkably, the bulk of the aid, €270 billion, will be given as direct payments, and from them, 10% will be bound to small and medium-sized farmers (European Commission, 2023). Despite this redistribution, it could be argued that the *status quo* will be essentially preserved, as much of the support rewards the number of hectares – thus benefiting big farms over small ones. In addition, direct payments only will be granted to farmers that exceed an area threshold and/or a minimum direct payment set by Member States, which would exclude very small farms from this support.

Interestingly, some of the actions displayed in Table 3 are not specifically targeted to small farms or small food businesses, but may affect the drivers identified above as influencing the feasibility of the stakeholders' proposals, such as the rural demographic trends (rural revitalisation actions) and the strength of collective action (collective environmental schemes).

## 5 Conclusions

This study is based on foresight workshops held in Europe aimed at envisioning how, in the view of relevant stakeholders, small farms and small food businesses may enhance their contribution to FNS. We have captured the participants' priorities through six interconnected objectives. Despite the great differences between the European regions in which the workshops took place, the proposed actions around these objectives and the stakeholders' main concerns present large commonalities. The empowerment of small farms/small food businesses in the public sphere received particular attention in all the regions and emerged as key to facilitating the achievement of the other goals. This emphasis can be attributed to the recognition that small food producers require such support to sustain their activities – as we hypothesised at the beginning. Stakeholders also clearly challenged a *productivist* approach, with the underlying assumption that small farms and small food businesses best contribution to food security is the production of high-quality, healthy and sustainable food.

We also discuss that the feasibility of the actions envisaged by the stakeholders would largely depend on a number of factors or drivers, among which the strength of collective action stands out. Furthermore, stakeholders' views and assumptions connect with issues largely disputed in literature. Remarkably, they did not prioritise actions aimed at increasing production or productivity, although post-Covid-19 lessons have highlighted the need for upscaling produce from small farms to improve local food systems' resilience (Sanderson Bellamy et al., 2021).

Finally, an increased representativeness and involvement of small farms and small food businesses in the policy construction process would be needed to better integrate their needs and potential in the development and implementation of food policies (Šūmane et al., 2021). Despite the emphasis placed by the EU around the importance small farmers (European Parliament Research Service, 2022), it could be argued that they are not given an ambitious and over-arching consideration tailored at their specific needs in the Common Agricultural Policy. Policies should remove knowledge, infrastructural and governance barriers to provide a fair access of small food farms and businesses to markets, and support the construction of enabling environments wherein these producers can maximise their capacity to survive, contribute to food security and secure decent incomes to the farm households.

As a limitation of this study, it should be acknowledged that, due to the timing of the study, we were unable to directly assess the effects of Brexit and the COVID-19 pandemic on the stakeholders' vision and their subsequent implications for the findings. Although we have discussed our results in light of the most recent literature, this limitation emphasises the

need for future research to delve deeper into how these transformative events have shaped the perspectives and priorities of the stakeholders involved in small farms' and small food businesses' contribution to food security.

**Acknowledgements** This research was supported by the 'Small Farms, Small Food Businesses and Sustainable Food Security' (SALSA) project, which has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 677363.

## Declarations

**Conflict of interest** The authors declare that they have no conflict of interest.

**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

## References

- Altieri, M. A., & Nicholls, C. I. (2020). Agroecology and the reconstruction of a post-COVID-19 agriculture. *Journal of Peasant Studies*, 47(5), 881–898. <https://doi.org/10.1080/03066150.2020.1782891>
- Arnalte-Mur, L., Ortiz-Miranda, D., Cerrada-Serra, P., Martínez-Gómez, V., Moreno-Pérez, O., Barbu, R., Bjorkhaug, H., Czekaj, M., Duckett, D., Galli, F., Goussios, G., Grivins, M., Hernández, P. A., Prospero, P., & Šūmane, S. (2020). The drivers of change for the contribution of small farms to regional food security in Europe. *Global Food Security*, 26, 100395. <https://doi.org/10.1016/j.gfs.2020.100395>
- Barrett, C. B., Beaudreault, A. M., Meinke, H., Ash, A., Ghezze, N., Kadiyala, S., Nigussie, M., Grove Smith, A., & Torrance, L. (2021). Foresight and trade-off analyses: Tools for science strategy development in agriculture and food systems research. *Q Open*, 1(1), 1–7. <https://doi.org/10.1093/qopen/qoaa002>
- Bijman, J., & Wijers, G. (2019). Exploring the inclusiveness of producer cooperatives. *Current Opinion in Environmental Sustainability*, 41, 74–79. <https://doi.org/10.1016/j.cosust.2019.11.005>
- Bjonec, S., & Ferto, I. (2016). Financial constraints and farm investments in Slovenia. *New Medit*, 15(4), 2–9
- Buck, D., Getz, C., & Guthman, J. (1997). From farm to table: The organic vegetable commodity chain of northern California. *Sociologia Ruralis*, 37, 3–20. <https://doi.org/10.1111/1467-9523.00033>
- Cerrada-Serra, P., Moragues-Faus, A., Zwart, T. A., Adlerova, B., Ortiz-Miranda, D., & Avermaete, T. (2018). Exploring the contribution of alternative food networks to food security. A comparative analysis. *Food Security*, 6(1), 1371–1388. <https://doi.org/10.1007/s12571-018-0860-x>
- Cicatiello, C. (2020). Alternative food shoppers and the “quantity dilemma”: A study on the determinants of their purchases at alternative markets. *Agricultural and Food Economics*, 8, 15. <https://doi.org/10.1186/s40100-020-00160-6>



- Czekaj, M., Adamsone-Fiskovica, A., Tyran, E., & Kilis, E. (2020). Small farms' resilience strategies to face economic, social, and environmental disturbances in selected regions in Poland and Latvia. *Global Food Security*, 26, 100416. <https://doi.org/10.1016/j.gfs.2020.100416>
- Darnhofer, I. (2020). Farm resilience in the face of the unexpected: Lessons from the COVID-19 pandemic. *Agriculture and Human Values*, 37(3), 605–606. <https://doi.org/10.1007/s10460-020-10053-5>
- Davidova, S., & Thomson, K. (2014). Family farming in Europe: Challenges and prospects. In-depth analysis. *Directorate general for internal policies, policy department B: Structural and cohesion policies*. European Parliament's committee on agriculture and rural development. Retrieved January, 2022, from [https://www.europarl.europa.eu/RegData/etudes/note/join/2014/529047/IPOL-AGRI\\_NT%282014%29529047\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/note/join/2014/529047/IPOL-AGRI_NT%282014%29529047_EN.pdf)
- De Rosa, M., Felice, A., & Yari, V. (2017). Building up collective actions to qualify GIs. *Land Use Policy*, 66, 340–345. <https://doi.org/10.1016/j.landusepol.2017.05.007>
- Devereux, S., Béné, C., & Hoddinott, J. (2020). Conceptualising COVID-19's impacts on household food security. *Food Security*, 12(4), 769–772. <https://doi.org/10.1007/s12571-020-01085-0>
- Duckett, D., Rivington, M. R., King, J.-B.A., & Lorenzo-Arribas, A. (2021). *Scenarios for UK food and nutrition security in the wake of the COVID-19 pandemic* (p. 22). The James Hutton Institute.
- Duckett, D. G., McKee, A. J., Sutherland, L.-A., Kyle, C., Boden, L. A., Auty, H., Bessell, P. R., & McKendrick, I. J. (2017). Scenario planning as communicative action: Lessons from participatory exercises conducted for the Scottish livestock industry. *Technological Forecasting and Social Change*, 114, 138–151. <https://doi.org/10.1016/j.techfore.2016.07.034>
- European Commission. (2020). *A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food System. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee of the Regions*. COM (2020) 381 final
- European Commission. (2021). *A Long-Term Vision for the EU's Rural Areas - Towards stronger, connected, resilient and prosperous rural areas by 2040*. COM (2021) 345 final
- European Commission. (2023). *The common agricultural policy: 2023–27*. Retrieved January, 2022, from [https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cap-2023-27\\_en](https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cap-2023-27_en)
- European Parliament. (2021). European Parliament legislative resolution of 23 November 2021 on the proposal for a regulation of the European Parliament and of the Council establishing rules on support for strategic plans to be drawn up by Member States under the Common agricultural policy (CAP Strategic Plans) and financed by the European Agricultural Guarantee Fund (EAGF) and by the European Agricultural Fund for Rural Development (EAFRD) and repealing Regulation (EU) No 1305/2013 of the European Parliament and of the Council (COM(2018)0392 – C8-0248/2018 – 2018/0216(COD))
- European Parliament Research Service. (2022). *Small farms' role in the EU food system*. PE 733.630 – September. Retrieved from: [https://www.europarl.europa.eu/thinktank/en/document/EPRS\\_BRI\(2022\)733630](https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2022)733630). Accessed 12 Dec 2023.
- Eurostat. (2018). *Agriculture, Forestry and Fishery Statistics*. Retrieved January, 2022, from <https://ec.europa.eu/eurostat/documents/3217494/9455154/KS-FK-18-001-EN-N.pdf/a9ddd7db-c40c-48c9-8ed5-a8a90f4faa3f>
- Galiano, S. (2017). La formación del monocultivo olivarero en la comarca Campiña de Jaén. *Investigaciones Geográficas*, 67, 123–141.
- Galli, F., Grando, S., Adamsone-Fiskovica, A., Bjørkhaug, H., Czekaj, M., Duckett, D. G., et al. (2020). How do small farms contribute to food and nutrition security? Linking European small farms, strategies and outcomes in territorial food systems. *Global Food Security*, 26, 100427. <https://doi.org/10.1016/j.gfs.2020.100427>
- García Álvarez-Coque, J. M., Martínez-Gomez, V., & Tudela-Marco, L. (2021). Multi-actor arrangements for farmland management in eastern Spain. *Land Use Policy*, 111, 105738. <https://doi.org/10.1016/j.landusepol.2021.105738>
- Guarín, A., Rivera, M., Pinto-Correia, T., Guiomar, N., Šūmane, S., & Moreno-Pérez, O. M. (2020). A new typology of small farms in Europe. *Global Food Security*, 26, 100389. <https://doi.org/10.1016/j.gfs.2020.100389>
- Guiomar, N., et al. (2018). Typology and distribution of small farms in Europe: Towards a better picture. *Land Use Policy*, 75, 784–798. <https://doi.org/10.1016/j.landusepol.2018.04.012>
- Guth, M., Stepień, S., Smędzik-Ambroży, K., & Matuszczak, A. (2022). Is small beautiful? Technical efficiency and environmental sustainability of small-scale family farms under the conditions of agricultural policy support. *Journal of Rural Studies*, 89, 235–247. <https://doi.org/10.1016/j.jrurstud.2021.11.026>
- Hernández, P. A., Galli, F., Prospero, P., Šūmane, S., Duckett, D., & Almaas, H. (2021). Do small food businesses enable small farms to connect to regional food systems? Evidence from 9 European regions. *Global Food Security*, 29, 100505. <https://doi.org/10.1016/j.gfs.2021.100505>
- Hobbs, J. E. (2020). Food supply chains during the COVID-19 pandemic/Abstract Abstrait. *Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie*, 68(2), 171–176.
- Hodgins, K. J., & Fraser, E. D. G. (2018). “we are a business, not a social service agency.” barriers to widening access for low-income shoppers in alternative food market spaces. *Agriculture and Human Values*, 35, 146–162. <https://doi.org/10.1007/s10460-017-9811-y>
- Jentoft, S., Bavinck, M., Alonso-Población, E., Child, A., Diegues, A., Kalikoski, D., Kurien, J., McConney, P., Onyango, P., Siar, S., & Solis Rivera, V. (2018). Working together in small-scale fisheries: Harnessing collective action for poverty eradication. *Maritime Studies*, 17, 1–12. <https://doi.org/10.1007/s40152-018-0094-8>
- Juntti, M., & Downward, S. D. (2017). Interrogating sustainable productivism: Lessons from the ‘Almerian miracle.’ *Land Use Policy*, 66, 1–9. <https://doi.org/10.1016/j.landusepol.2017.04.016>
- Kaczorowska, J., Prandota, A., Rejman, K., Halicka, E., & Tul-Krzyszczuk, A. (2021). Certification labels in shaping perception of food quality—insights from Polish and Belgian urban consumers. *Sustainability*, 13(2), 702. <https://doi.org/10.3390/su13020702>
- Karasmanaki, E., Mangioros, V., Fyttopoulou, E., & Tsantopoulos, G. (2020). The practices of small and medium-sized agricultural businesses affecting sustainability and food security. *Journal for Global Business Advancement*, 13(2), 205–227. <https://doi.org/10.1504/JGBA.2020.110611>
- Kos, D., & Kloppenburg, S. (2019). Digital technologies, hyper-transparency and smallholder farmer inclusion in global value chains. *Current Opinion in Environmental Sustainability*, 41, 56–63. <https://doi.org/10.1016/j.cosust.2019.10.011>
- Krzysztofowicz, M., Rudkin, J., Winthagen, V., & Bock, A. (2020). *Farmers of the future, EUR 30464 EN*. Publications Office of the European Union
- Lamine, C., Garçon, L., & Brunori, G. (2019). Territorial agrifood systems: A Franco-Italian contribution to the debates over alternative food networks in rural areas. *Journal of Rural Studies*, 68, 159–170. <https://doi.org/10.1016/j.jrurstud.2018.11.007>
- Looga, J., Jürgenson, E., Sikk, K., Matveev, E., & Maasikamäe, S. (2018). Land fragmentation and other determinants of agricultural farm productivity: The case of Estonia. *Land Use Policy*, 79, 285–292. <https://doi.org/10.1016/j.landusepol.2018.08.021>

- Marsden. (2017). Theorising food quality: Some key issues in understanding its competitive production and regulation. In M. Harvey, A. McMeekin, & A. Warde (Eds.), *Qualities of food* (pp. 129–155). Manchester University Press.
- Milone, P., & Ventura, F. (2019). New generation farmers: Rediscovering the peasantry. *Journal of Rural Studies*, 65, 43–52. <https://doi.org/10.1016/j.jrurstud.2018.12.009>
- Moragues-Faus, A., Sonnino, R., & Marsden, T. (2017). Exploring European food system vulnerabilities: Towards integrated food security governance. *Environmental Science & Policy*, 75, 184–215. <https://doi.org/10.1016/j.envsci.2017.05.015>
- Moreno-Pérez, O. M. (2013). Reproducing productivism in Spanish agricultural systems. In D. Ortiz, A. Moragues, & E. Arnalte (Eds.), *Agriculture in Mediterranean Europe: Between old and new paradigms. Research in rural sociology and development*, 19 (pp. 121–147). Emerald Group publishing limited. [https://doi.org/10.1108/S1057-1922\(2013\)0000019008](https://doi.org/10.1108/S1057-1922(2013)0000019008)
- Mount, P., & Smithers, J. (2014). The conventionalization of local food: Farm reflections on local, alternative beef marketing groups. *Journal of Agriculture, Food Systems, and Community Development*, 4(3), 101–119. <https://doi.org/10.5304/jafscd.2014.043.002>
- Noble, C., Townsend, L., Currie, M., Hardy, C., & Duckett, D. (2023). *The impacts of COVID-19 on digitalisation and social capital in crafting communities in Scotland*. Scottish Geographical Journal, advanced online publication. <https://doi.org/10.1080/14702541.2023.2259866>
- OECD. (2020). *Strategic foresight for the COVID-19 crisis and beyond: Using futures thinking to design better public policies*. 10 June. <https://www.oecd.org/coronavirus/policy-responses/strategic-foresight-for-the-covid-19-crisis-and-beyond-using-futures-thinking-to-design-better-public-policies-c3448fa5/>
- Ortiz-Miranda, D., Moreno-Pérez, O., Arnalte-Mur, L., Cerrada-Serra, P., Martínez-Gomez, V., Adolph, B., Atela, J., Ayambila, S., Baptista, I., Barbu, R., Bjørkhaug, H., Czekaj, M., Duckett, D., Fortes, A., Galli, F., Goussios, G., Hernández, P. A., Karanikolas, P., Machila, K., Oikonomopoulou, E., et al. (2022). The future of small farms and small food businesses as actors in regional food security: A participatory scenario analysis from Europe and Africa. *Journal of Rural Studies*, 95, 326–335. <https://doi.org/10.1016/j.jrurstud.2022.09.006>
- Parker, J. S., DeNiro, J., Ivey, M. L., & Doohan, D. (2016). Are small and medium scale produce farms inherent food safety risks? *Journal of Rural Studies*, 44, 250–260. <https://doi.org/10.1016/j.jrurstud.2016.02.005>
- Pindado, E., Sánchez, M., Verstegen, J. A. A. M., & Lans, T. (2018). Searching for the entrepreneurs among new entrants in European agriculture: The role of human and social capital. *Land Use Policy*, 77, 19–30. <https://doi.org/10.1016/j.landusepol.2018.05.014>
- Plonka, A. (2019). Knowledge of basic production safety standards and rules of good agricultural practice in opinions of agricultural owners. *Acta Scientiarum Polonorum Oeconomia*, 18(3), 65–72. <https://doi.org/10.22630/ASPE.2019.18.3.33>
- Rivera, M., Guarín, A., Pinto-Correia, T., Almaas, H., Arnalte Mur, L., Burns, V., Czekaj, M., Ellis, R., Galli, R., Grivins, M., Hernández, P., Karanikolas, P., Prospero, P., & Sánchez Zamora, P. (2020). Assessing the role of small farms in regional food systems in Europe: Evidence from a comparative study. *Global Food Security*, 26, 100417. <https://doi.org/10.1016/j.gfs.2020.100417>
- Sanderson Bellamy, A., Furness, E., Nicol, P., et al. (2021). Shaping more resilient and just food systems: Lessons from the COVID-19 pandemic. *Ambio*, 50, 782–793. <https://doi.org/10.1007/s13280-021-01532-y>
- Saviolidis, N. M., Olafsdottir, G., Nocolau, M., Samoggia, A., Huber, E., Brimont, L., Gorton, M., van Berlepsch, D., Sigurdardottir, H., Del Prete, M., Fedato, C., Aubert, P., & Bogason, S. G. (2020). Stakeholder perceptions of policy tools in support of sustainable food consumption in Europe: Policy implications. *Sustainability*, 12, 7161. <https://doi.org/10.3390/su12177161>
- Schneider, S., & Niederle, P. A. (2010). Resistance strategies and diversification of rural livelihoods: The construction of autonomy among Brazilian family farmers. *Journal of Peasant Studies*, 37(2), 379–405. <https://doi.org/10.1080/03066151003595168>
- Shucksmith, M., & Rønningen, K. (2011). The Uplands after neo-liberalism? – The role of the small farm in rural sustainability. *Journal of Rural Studies*, 27(3), 275–287. <https://doi.org/10.1016/j.jrurstud.2011.03.003>
- Sodano, V. (2012). Food policy beyond neo-liberalism. In D. Erasga (Ed.), *Sociological landscape-theories, realities and trends* (pp. 375–402). InTech. <https://doi.org/10.5772/37175>
- Sonia-Lara, J. A., & Banister, D. (2017). Participatory visioning in transport backcasting studies: Methodological lessons from Andalusia (Spain). *Journal of Transport Geography*, 58, 113–126. <https://doi.org/10.1016/j.jtrangeo.2016.11.012>
- Šūmane, S., Kunda, I., Knickel, K., Strauss, A., Tisenkopfs, T., des Ios Rios Rios, I., Rivera, M., Chebach, T., & Ashkenazy, A. (2018). Local and farmers' knowledge matters! How integrating informal and formal knowledge enhances sustainable and resilient agriculture. *Journal of Rural Studies*, 59, 232–241. <https://doi.org/10.1016/j.jrurstud.2017.01.020>
- Šūmane, S., Ortiz-Miranda, D., Pinto-Correia, T., Czekaj, M., Duckett, D., Galli, F., Grivins, M., Noble, C., Tisenkopfs, T., Toma, I., & Tsiligridis, T. (2021). Supporting the role of small farms in the European regional food systems: What role for the science-policy interface? *Global Food Security*, 28, 100433. <https://doi.org/10.1016/j.gfs.2020.100433>
- Sutherland, L. A., Madureira, L., Dirimanova, V., Bogusz, M., Kania, J., Vinohradnik, K., Creaney, R., Duckett, D., Koehnen, T., & Knierim, A. (2017). New knowledge networks of small-scale farmers in Europe's periphery. *Land Use Policy*, 63, 428–439. <https://doi.org/10.1016/j.landusepol.2017.01.028>
- Szegedyné Fricz, A., Itzész, A., Ózsvári, L., Szakos, D., & Kasza, G. (2020). Consumer perception of local food products in Hungary. *British Food Journal*, 122(9), 2965–2979. <https://doi.org/10.1108/BFJ-07-2019-0528>
- Van Berbel, D. B., & Verburg, P. H. (2012). Combining exploratory scenarios and participatory backcasting: Using an agent-based model in participatory policy design for a multi-functional landscape. *Landscape Ecology in Practice*, 27, 641–658. <https://doi.org/10.1007/s10980-012-9730-7>
- Varga, M. (2016). Small farms survival and growth: Making investments despite credit constraints. *Sociologia Ruralis*, 57(S1), 641–660. <https://doi.org/10.1111/soru.12149>
- Vergragt, P., & Quist, J. (2011). Backcasting for sustainability: Introduction to the special issue. *Technological Forecasting and Social Change*, 78(5), 747–755. <https://doi.org/10.1016/j.techfore.2011.03.010>
- Wiggins, S., Kirsten, J., & Llambi, L. (2010). The future of small farms. *World Development*, 38(10), 1341–1348. <https://doi.org/10.1016/j.worlddev.2009.06.013>
- Žmija, K., Fortes, A., Nganwani, T. M., Šūmane, S., Ayambila, S. N., Žmija, D., Satoła, Ł., & Sutherland, L. A. (2020). Small farming and generational renewal in the context of food security challenges. *Global Food Security*, 26, 100412. <https://doi.org/10.1016/j.gfs.2020.100412>





**Olga M. Moreno Pérez** is an Agricultural Engineer and Graduate in Economics. She works as an Assistant Professor in the Department of Social Sciences at the Universitat Politècnica de València (Spain). Her research areas are the patterns of agrarian change in Europe, agricultural restructuring, micro-level processes of farm differentiation, family farming, local food systems, small farms and food security in Europe. She combines quantitative and qualitative research methods and have extensively worked in participatory foresight analysis. She has participated, among other national and European research projects, in EU-7th FP project TRANSMANGO “Assessment of the impact of global drivers of change on Europe’s food security” and H2020 project SALSA “Small farms, small foodbusinesses and sustainable food security”.

worked for more than 10 years in the international development sector, with special focus on African rural development, agricultural producer organisations and sustainable natural resource management.



**Laura Arnalte-Mur** is an Agricultural Engineer, MSc in Natural Resource Management and MPhil in Agricultural and Environmental Economics, currently working as a researcher at the Department of Economics and Social Sciences of the Polytechnic University of Valencia (Spain). She has participated in European research projects and contributed to several academic publications regarding the role of small farms in regional food systems in Europe. Previously, she

worked for more than 10 years in the international development sector, with special focus on African rural development, agricultural producer organisations and sustainable natural resource management.



**Pedro Cerrada-Serra** holds a PhD in Agrifood Economics, carried out in the Department of Economics and Social Sciences at the Universitat Politècnica de València, UPV (Spain). His research fields of interest revolve around sustainable urban and peri-urban food systems and urban food policies. He has participated in two EU research projects: TRANSMANGO (FP7) and SALSA (H2020).



**Victor Martinez-Gomez** works as an associate professor at the Department of Economics and Social Sciences of the Universitat Politècnica de València (UPV), Spain. His researches focus on the relationship between agricultural policies and trade, and also on social innovation in the agricultural sector. In particular he has worked on farm structures, land consolidation and how small and family farms engage in the agricultural system. In this respect he has participated in a number of research projects and has co-authored several published papers in the last years. In addition, he is collaborating with the agricultural sector in the Valencia region to foster social innovation in land consolidation processes through the Agricultural Structures chair.

worked for more than 10 years in the international development sector, with special focus on African rural development, agricultural producer organisations and sustainable natural resource management.



**Anda Adamson-Fiskovica** is a researcher at the Baltic Studies Centre in Riga, Latvia. She holds a master’s degree in Society, Science and Technology in Europe from Linköping University and a doctoral degree in sociology from the University of Latvia. Her academic interests lie in the field of social studies of science and technology, agricultural knowledge and innovation systems, and food studies.



**Hilde Bjørkhaug** is Professor in sociological theory at Norwegian University of Science and Technology. Her research interests span from aspects of agricultural restructuring, the role of small and medium farms on food and nutrition security, and challenges to farming. She also studies the agri-food value chain including questions on ethics, power relations, policy and financialization. Her most recent co-edited book, with colleagues Philip McMichael and Bruce Muirhead is *Finance or Food?: The Role of*

*Cultures, Values, and Ethics in Land Use Negotiations* (2020 on University of Toronto Press). Bjørkhaug is Secretary/Treasurer of the executive board of the International Sociological Association’s Research Committee 40 (the sociology of agriculture and food) and an active member of the European Society for Rural Sociology.



**Gianluca Brunori** is Full Professor at the University of Pisa, where he teaches Food Policy and Bioeconomy. As a researcher, he has accumulated 30 years of experience in the fields of Agricultural Economics, Rural Sociology and Food Policy, participating to several European Projects, in three of them (TRUC, GLAMUR, and DESIRA) as scientific coordinator. He has been President of the Research Committee “Sociology of Agriculture and Food” (RC-40) of the International Sociology Association, and vice-president of the European Society of

Rural Sociology. He has been Chief Editor of the journal “Rivista di Economia Agraria” and is editor in chief of the journal Agriculture and Food Economics. He has served as a member – and in two years as a chair - of the expert panel of EU SCAR (Standing Committee for Agricultural Research) 2nd, 3rd, 4th and 5th foresight exercise. He is also chair of the Scientific Advisory Board of the Joint Programming Initiative “Agriculture, Food Security and Climate Change” (FACCE).



**Marta Czekaj** PhD. University of Agriculture in Krakow The Faculty of Agriculture and Economics. The main research activities concern small farms, their condition and importance for local environment, economic efficiency in farms (especially in regions with disadvantaged in agricultural production) and direct selling of food products.



**Dominic Duckett** is a researcher on risk in the Department of Finance, Accounting, and Risk of the Glasgow Caledonian University. He applies social theories of risk to socio-technical risk around agricultural production and environmental hazards. He works extensively with issues relating to rural sociology and food systems. These include

Food and Nutrition Security (FNS), Spatial Justice, Digitisation in rural areas, technological surveillance of livestock (EID), and agricultural knowledge and information systems (AKIS). Work also includes developing Scotland's strategic resource looking at water reuse for Scotland's Centre of Expertise on Waters (CREW) and developing visual research methods around participatory mapping using touch table technology. He is an expert in participatory scenario planning methodology and has pioneered virtual and blended scenario workshops during the pandemic.



**Paola A. Hernández** is a PhD candidate at the Mediterranean Institute for Agriculture, Environment and Development (MED) of the Universidade de Évora in Portugal. Formerly trained in Sociocultural Anthropology, her current research in Geography (Interdisciplinary Landscape Management) focuses on the access to local foods in rural areas and food systems governance in Portugal, touching upon issues on sustainable transitions, rural development and food sovereignty. Paola has carried out prior work and

research on small-scale food systems, the human right to food and nutrition, and participatory local food systems in Canada and Portugal.



**Dr. Christina Noble** is a social scientist in the Social, Economic and Geographical Sciences group with the James Hutton Institute. She is interested in rural geography, namely rural migration studies and conduct research set in remote rural and island communities of Scotland and Ireland. Research into crofting and small farms within rural communities are a particular interest as well as the role digital

technologies can play in supporting resilience levels and maximising opportunities created by digitisation. Email: christina.noble@hutton.ac.uk; phone: 01224 396316; Twitter: @CNoble\_research. Postal address: The James Hutton Institute, Craigiebuckler, Aberdeen, AB15 8QH



**Teresa Pinto-Correia** is a geographer, Professor at the University of Évora, with a record of projects and publications on the processes of change in European rural landscapes at multiple scales. Director of MED ([www.med.uevora.pt](http://www.med.uevora.pt)) where a systemic and interdisciplinary research is applied to Mediterranean agriculture and Environment. Vice-Chair of the Mission Board on Soil Health and Food, from Horizon Europe.





**Aleksandra Płonka PhD** is an assistant professor at the Department of Economics and Food Economy, Faculty of Agriculture and Economics, University of Agriculture in Krakow. In 2015, she defended her doctoral thesis at the Faculty of Economic Sciences of the Warsaw University of Life Sciences. She is the author or co-author of over 70 original scientific and popular science works published in domestic and foreign journals. She participated in the implementation of research projects financed by the National Science Center and Horizon

2020, as well as in several training and educational projects as an expert. She completed several internships at foreign research centers. Agricultural advisor. MBA graduated. In her scientific and research work, he focuses on issues in the field of economic theory and market economy, in particular issues of economic prosperity, agricultural and environmental economics, agricultural and structural policy of the European Union, including state interventionism and agricultural advisory services.



**Paolo Prosperi** is lecturer and researcher of agricultural and food economics at the Mediterranean Agronomic Institute of Montpellier - UMR Moisa, Univ Montpellier, CIHEAM-IAMM, CIRAD, INRAE, IRD, L'Institut Agro, Montpellier, France. He obtained a PhD in Economics from the University of Montpellier and a PhD in Agricultural Economics from the University of Catania (Italy). He is member of the Joint Research

Center MOISA (Montpellier Interdisciplinary center on Sustainable Agri-food systems). His researches focus on the economic dynamics that characterise the functioning of sustainable food systems, with particular interest for the interactions of stakeholders within agri-food value chains, and for the adaptation of innovative, sustainable and circular business models. He is active in international research projects in Europe, in the Mediterranean region and in Africa, including EU funded programs such as the PRIMA project Med-Links, the EU Tempus project QESAMed, and the EU Horizon 2020 projects HealthyFoodAfrica, SALSA, SUFISA, SHERPA, LIAISON.



**Mark Redman** is an independent rural development consultant based in Romania. He has 35 years of experience in research, consultancy, teaching and training activities in sustainable agriculture and rural development. He has lived and worked in central and eastern Europe since the mid-1990s and has over 20 years of specific experience providing technical assistance to the development of agri-environment

policies, agricultural pollution control schemes, rural development plans and rural networks in post-communist countries. More recently he is the co-owner and Director of Highclere Consulting S.R.L, a private consultancy company specialised in policy evaluation for the European Commission, together with networking, communication and facilitation for EU-funded research and innovation projects.



**Maria Rivera** is a Postdoc Researcher for the University of Évora (MED institute) currently involved in H2020 project LIAISON and FCT TRUST projects on social innovation. Ph.D. on Rural Development Project Planning and Sustainable Management by the Technical University of Madrid. Graduated from Keele University in the U.K. on Environmental Sciences and International Relations. María has

experience on the dynamics and the sociology of rural areas and communities as well as on project management. She participated in many EU financed projects in the fields of food systems, rural development, rural innovation and agricultural sociology. Her main research interests are: social innovation, food systems and landscape management.




**Sandra Šumane** works as a sociologist at the research institute Baltic Studies Centre, Riga, Latvia. Her research interests are linked to sustainable agriculture and food systems. Her work focuses on how sustainability transitions in agriculture can be enabled through farmer innovation and learning, and supporting them agricultural knowledge and innovation systems and governance frameworks.



**Dionisio Ortiz-Miranda** is a Full Professor in the Department of Economics and Social Sciences at the Universitat Politècnica de València, UPV (Spain). He belongs to the research group of International Economy and Development of the aforementioned department. Dionisio's research focuses on agricultural and rural policies and collective action and governance in farming communities and rural areas. He has led the UPV team in several Euro-

pean projects (TRANSMANGO, VITAL, SALSA) revolving around food security and developing foresight approaches.

## Authors and Affiliations

Olga M. Moreno-Pérez<sup>1</sup>  · Laura Arnalte-Mur<sup>2</sup> · Pedro Cerrada-Serra<sup>2</sup> · Victor Martinez-Gomez<sup>1</sup> · Anda Adamsone-Fiskovica<sup>3</sup> · Bjørkhaug<sup>4</sup> · Gianluca Brunori<sup>5</sup> · Marta Czekaj<sup>6</sup> · Dominic Duckett<sup>12</sup> · Paola A. Hernández<sup>8</sup> · Christina Noble<sup>7</sup> · Teresa Pinto-Correia<sup>9</sup> · Aleksandra Płonka<sup>6</sup> · Paolo Prosperi<sup>10,13</sup> · Mark Redman<sup>11</sup> · Maria Rivera<sup>8</sup> · Sandra Šūmane<sup>3</sup> · Dionisio Ortiz-Miranda<sup>1</sup>

✉ Olga M. Moreno-Pérez  
omoreno@esp.upv.es

Laura Arnalte-Mur  
lauarmur@upv.es

Victor Martinez-Gomez  
vicmargo@esp.upv.es

Anda Adamsone-Fiskovica  
anda.adamsone-fiskovica@bscresearch.lv

Bjørkhaug  
hilde.bjorkhaug@ntnu.no

Gianluca Brunori  
gianluca.brunori@unipi.it

Marta Czekaj  
marta.czekaj@urk.edu.pl

Dominic Duckett  
Dominic.Duckett@gcu.ac.uk

Paola A. Hernández  
paolaher@uevora.pt

Christina Noble  
christina.noble@hutton.ac.uk

Teresa Pinto-Correia  
mtpc@uevora.pt

Aleksandra Płonka  
aleksandra.plonka@urk.edu.pl

Paolo Prosperi  
prosperi@iamm.fr

Mark Redman  
mark@highclere-consulting.com

Maria Rivera  
mrmendez@uevora.pt

Sandra Šūmane  
sandra.sumane@bscresearch.lv

Dionisio Ortiz-Miranda  
dortiz@esp.upv.es

<sup>1</sup> Group of International Economics and Development, Department of Economics and Social Sciences, Universitat Politècnica de València, Camino de Vera, s/n, 46022 Valencia, Spain

<sup>2</sup> Department of Economics and Social Sciences, Universitat Politècnica de València, Camino de Vera, s/n, 46022 Valencia, Spain

<sup>3</sup> Baltic Studies Centre, Kokneses prospekts 26-2, Riga LV-1014, Latvia

<sup>4</sup> Department of Sociology and Political Science, Norwegian University of Science and Technology and RURALIS, Trondheim, Norway

<sup>5</sup> Pisa Agricultural Economics group (PAGE), University of Pisa, Pisa, Italy

<sup>6</sup> University of Agriculture in Krakow, The Faculty of Agriculture and Economics, Al. Mickiewicza 21, 31-120, Krakow, Poland

<sup>7</sup> The James Hutton Institute, Craigiebuckler Aberdeen, Scotland AB15 8QH, UK

<sup>8</sup> MED – Mediterranean Institute for Agriculture, Environment and Development & CHANGE – Global Change and Sustainability Institute, Instituto de Investigação e Formação Avançada, Universidade de Évora, Ap. 94, 7002-554 Évora, Portugal

<sup>9</sup> MED Mediterranean Institute for Agriculture, Environment and Development & Departamento de Paisagem Ambiente e Ordenamento, Escola de Ciências e Tecnologia, Universidade de Évora, Apartado 94, 7006-554 Évora, Portugal

<sup>10</sup> CIHEAM-IAMM, UMR MoISA, Montpellier, France

<sup>11</sup> Highclere Consulting SRL, Str. Tohanita 28B, Zarnesti, 505800 Brasov, Romania

<sup>12</sup> Department of Finance, Accounting, and Risk, Glasgow Caledonian University, G4 0BA, Cowcaddens Road, Glasgow, Scotland

<sup>13</sup> MoISA, Univ Montpellier, CIHEAM-IAMM, CIRAD, INRAE, Institut Agro, IRD, Montpellier, France