



Strengthening the sustainability of European food chains through quality and procurement policies

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ABSTRACT

Background: The nexus of agri-food and sustainability in economic development has recently attracted the interest of policymakers, as global challenges like climate change and food security are revisited and reassessed. The critical role of food production in economic development has been emphasized through targeted agricultural quality policies. Many developed countries worldwide, including EU member states, have introduced food quality policies that could support sustainability.

Scope and approach: This paper combines knowledge obtained by several groups in a broad EU study and the reflections on policy-related results by EU-stakeholders, streamlined by a Delphi analysis. Current work presents research-based policy recommendations and statements on various quality schemes, introductory inferred from expert opinions throughout Europe, gauged through a modified policy Delphi framework.

Key findings and conclusions: A roadmap of policy and practical proposals have been identified for all key stakeholders involved in these initiatives, implying the need to reshape the supply chain dynamics to continuously improve producers, processors, retailers, and consumers within the EU and definitively worldwide. Furthermore, implementing a holistic approach considering environmental and socio-economic features can improve the effectiveness of EU food quality policies.

1. Introduction

Improving food-chain sustainability is a complicated procedure incorporating economic, environmental, and social dimensions that must be integrated into a coherent system to be successful. Quality is a crucial component of this system as it contributes to achieving economic growth, while its role, especially in business competitiveness, must be considered when shaping any development strategy; particularly for the food industry, which should strive to provide high-quality food in all markets (Du & Sun, 2006). In addition, as the food industry comprises the central axis of the food supply chain, it can link many retail companies to the agricultural sector, thus having a significant positive

impact on employment (Mattas & Tsakiridou, 2010). Increased attention has been shifted towards food quality in later years, particularly in the EU, due to the dynamic and fluctuating demands of the market. Specifically, changes in the food chain composition (more complex food chain, overpriced food services), demographic composition, social status, consumer behaviour, and lifestyle (Luning & Marcelis, 2007) impact the food chain. Key players throughout the production, processing and distribution of food attach great importance to establishing and maintaining trust relationships with consumers regarding the safety, quality, and hygiene of food (Motarjemi & Mortimore, 2005). The EU recently designed its Common Agricultural Policy context to emphasize the ‘quality turn’ in the food supply chain: moving towards a food

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production with standardized quality conventions and supporting localized and eco-friendly products on trust and tradition. Ultimately, this may have specific socio-economic impacts (at a regional and farm level), various environmental effects, and increased interest on behalf of the consumers.

Within this policy agenda, measures signified to agricultural product quality systems have also been regulated aiming to impart to the growth of less-favoured areas (Barham & Sylvander, 2011; Belletti et al., 2017; Vandecastelaere et al., 2011), where geographical constraints confine the competitiveness of price-based products whilst boosting production cost. Also included in the framework is disseminating these specific product characteristics to consumers, allowing producers to offer a unique and differentiated product of higher quality and at a higher price. However, the preservation and development of local production systems to produce high-quality food necessitate adopting a more sustainable approach, in which key food-chain actors and stakeholders are involved through proactively collaborating towards achieving the same objectives. Public institutions can directly promote such initiatives by arranging appropriate tenders for public food procurement within their territory. Towards this direction, European Directive 2014/24 on public procurement gives provision to member states to design procurement contracts to promote socio-economic and environmental goals. Likewise, consumers show an increased interest in sustainable food systems and the development of Short Food Supply Chains (SFSCs), which some may argue can enable farmers for increased turnover and security to sell (Vittersø et al., 2019). In this context, local produce may benefit from an active local environment, i.e., reputation, institutions, and governance actions.

Much of the debate among policymakers contend that the local food systems are inherently beneficial to local communities and regional economies in general. Still, policymakers and economic development professionals are faced with fundamental queries about the competence of these systems in supporting the economic viability of local communities. As such, to promote these systems and adopt policies to support them, policymakers must reconsider the beneficial claims of SFSCs using scientific evidence. This paper reports research carried out in the EU funded H2020 project entitled ‘Strengthening European Food Chain Sustainability by Quality and Procurement Policy (S2F)’. The study identifies and investigates a set of policy and practical recommendations aiming to provide agri-food supply chain practitioners and policymakers with the suitable background to reinforce the ‘Food Quality Schemes’ (FQS), ‘Public Sector Food Procurement (PSFP)’ and ‘Short Food Supply Chains’ (SFSC) at national, EU and international levels. Specifically, the paper focuses on FQS, SFSC and PSFP using primary schools as a public institutional case example. To achieve these aims, the Delphi Policy exercise was conducted to map an explicit policy configuration to evaluate the impact of food quality and clear procurement policies, which will allow for a better understanding of the social and economic sustainability of EU rural areas.

The remainder paper includes an overview of the various FQS, SFSC and PSFP in Section 2, followed by a description of the Delphi technique in Section 3. Finally, Section 4 offers and discusses the key findings, whereas Section 5 concludes.

2. Background

Food quality schemes are multifaceted concepts developed on the interplay of distinctive constituents that the EU has developed, according to the Regulation (EU) No. 1151/2012, also known as “quality package”, to protect and promote products with specific features linked to their geographical origin as well as traditional products (Bonadonna et al., 2017). Accordingly, food products are enhanced through different quality systems like the European Food Quality Schemes i) comprising the Geographical Indications (GI) and Organic production (or FQS) classified by EU regulations (EU regulation 1151/2012 and Council Regulation (EC) 834/2007); ii) the SFSCs, as consumer regard them as

quality products but without an explicit designation (Chiffolleau & Dourian, 2020); and iii) the PSFP that significantly impact upon the consumers and the region by the public authorities, who are locally offering products with geographical indication, organic or SFSC products.

Concerning FQS, since the EU introduced a standard policy on products under this scheme, the role of the various determinants influencing and characterizing FQS has been underscored. Such factors include the quality and consumer perception, along with the region and the food value chains with their potential to depict and manage food production and deliver added value to producers. In terms of food quality, it is valued by consumers according to external features directly related to the product, referred to the characteristics of the supply chain factors, the production rules and how they are defined. In short, many dimensions of quality are taken into account, and consumers choose on the grounds of available information and environmental aspects (Arfini & Mancini, 2018).

The second factor influencing and characterizing FQS is the territory where a product is produced and where specific geographical and operational attributes can characterize the quality of the products (Barham & Sylvander, 2011). The place of production can facilitate the production and supply of the product, reduce transaction costs, and build its reputation (Gaitán-Cremaschi et al., 2019). Various supply chain management contexts create environmental and socio-economic repercussions (Arfini et al., 2012). Considering the above characteristics, the most efficient system of the product origin is depicted by the Local Agricultural Food System (LAFS), whose uniqueness lies in recognizing the region’s role and contributing to value creation within the supply chain. LAFS is a system that incorporates companies and consumers, covering products that are produced locally in the region of origin and linking also the environment and the regional economy (Zmija et al., 2019).

The value chain features comprise the third factor used to identify an FQS, referred explicitly to the organizational attribute of the agents, their potential to foist their bargaining power, accompanied by the existence of intermediaries in the supply chain and whether they can deliver added value (Arfini et al., 2016). Usually, supply chains, particularly in the agri-food sector, are considered a means for managing production and are helpful when creating suitable product quality controls and developing marketing strategies to create value for all chain actors (Zecca & Rastorgueva, 2014). Several FQS value chain typologies exist according to their amalgamation of structural and managerial characteristics. Common elements in FQS supply chains are compliance with European Union regulations, the existence of a rule setting intend in a code of practice, and a certification body that guarantees the conformity of operators with codes of practice (Bellassen et al., 2016).

The SFSCs address an extensive span of divergent contexts and schemes in the value chain and may be viewed as an alternative to organizing and managing conventional food sales. The various categories of SFSCs do not allow for a sole and clear definition (Chiffolleau & Dourian, 2020). However, the European Rural Development Regulation (1305/2013) describes a “short supply chain” as “a supply chain that includes a limited number of economic operators committed to cooperation, local economic development with close geographical and social relations between producers, processors and consumers”. In a general sense, the SFSCs are typically referred to as those food systems, locally integrated, which incorporate a direct (or close) interconnection among producers and consumers (Oostindie et al., 2016). The term “short” is inherent in the definition of SFSCs and presupposes physical or social proximity.

Physical proximity considers the distance travelled by the product from its point of production to the final consumer, often expressed in food miles. Social proximity reflects the number of intermediaries implicated in these supply chains, contrary to the conventional ones, and are deemed minimal (zero or very few intermediaries) (Chiffolleau & Dourian, 2020; Mancini & Arfini, 2018). This specific type of proximity

involves the close relationship of producers and consumers so that there is an interaction and information exchange concerning the product, its origin, its production method and its quality characteristics. In addition, there is an exchange of information on the ethical and social parameters of the production process and the cultural identity associated with the area involved (Galli and Brunori, 2013).

The various categories of SFSCs (i.e., farmer purchases, in-farm direct sales, consumer cooperatives, boxing systems, local farms/collective sales stores, direct internet sales, community-supported agriculture, local festivals et al.) indicate that different classification standards may exist, bearing in mind how many mediators participate in the chain, the physical distance/location, and the different management settings (Galli and Brunori, 2013). Based on extant classifications (Kneafsey et al., 2013), the Strength2Food H2020 Project delineated and defined three SFSC categories, namely: (i) Face-to-face systems where producers have direct contact with consumers without intermediaries; (ii) “close” systems where the delivery of the product takes place through an intermediary (iii) local systems where more than one intermediary participates in the transaction.

As for Public Sector Food Procurement (PSFC), European policy measures incorporate an interconnection of various models of school meal procurement, children’s health and nutrition and sustainability of the agri-food supply chains. Recently, the Directive 2014/24 has given more decisive impetus to the Member States to develop alternative arrangements for the supply of school meals, particularly those that support more significant contributions of small companies and display superior standards of food quality, nutrition, and sustainability. Furthermore, the focus on school meals in the current study was driven by the opportunity for innovative food procurement practices to inspire changes in health, knowledge, and practices amongst children and the broader community through children’s family and community connections as well as to the future as children move to adulthood.

The international literature reveals many claims about the positive effects of alternative school supply models (including PSFP) on enhancements in children’s health and well-being, local economic development, and community cohesion (Oostindjer et al., 2017; Tikkanen, 2014). Key topics frequently argued in the extant literature as prominent to the implementation of alternative school meals models. First, the national and regional policies and regulatory contexts, where research indicates why some countries implement more alternative PSFP models compared to others (Soares et al., 2015; Tikkanen, 2014). Second, the institutional and supplier practices in adopting PSFP models comprise the level at which the status and methods of the “alternative” suppliers pair those of the local municipalities/schools and vice versa. Few studies argue discrepancies between traditional concerns of public procurement functions (Galli et al., 2014; Tikkanen, 2014). Third, the institutional and community cultures, where the international literature asserts that in order to adopt alternative models, different cultural concessions are required on behalf of the municipalities, the suppliers, and schools (Mercado et al., 2016).

Therefore, given that there may be a close relationship between the production area and the food chains for FQS, SFSC and some forms of PSFP, the connection is not always clear. For some sectors, the link to the production area may be clear and very strong (e.g., Geographical Indications), intense though ambiguous (e.g., SFSC), subject to local procurement policy (i.e., PSFP) or absent (i.e., products) (Arfini et al., 2016). In this framework, stakeholders play critical roles in developing the policy roadmap since their reactions to specific policy implications, as observed by the Strength2Food project, may assist in identifying areas of agreement or disagreement on the issues raised. Their input may additionally assist in conveying the values of the broader community affected and align policy recommendations accordingly.

3. Methodological background

The Delphi technique is suitable for reaching consensus via several

rounds employing questionnaires to obtain data from a sample of respondents. Compared to other group member interaction methods, this uses multiple iterations to acquire consensus on a particular topic. It is broadly implemented to convert experts’ opinions into group consensus following a sequence of more than two systematized survey rounds (Jünger et al., 2017). A first-round comprises the preliminary measurement of opinions and continues with the data analysis and the formation of the new survey instrument (questionnaire) on the grounds of experts’ responses from the first round; finally, the method concludes with the second measurement of opinions (Strasser, 2017). The improvements/variations made to the Delphi Method arose from the researchers’ needs, from the requirements of the subjects to be studied, from the evolution and spread of technology and from the various scientific fields in which the method is widely used. The different method names tend to describe the different approaches of the method in each of its applications. Many authors come up with three basic types with a clear distinction between them, without undoing its various modification, namely The Classical or Conventional Delphi, the Policy Delphi, and the Decision Delphi (Jünger et al., 2017).

Generally, the method stimulates interaction between participants, facilitating synthesis from often geographically dispersed participants whilst minimizing process loss by retaining respondent anonymity pre-reducing the likelihood of common problems encountered with group-based research. It is primarily used for social analyses to gather a rich, essential, refreshing, and critical volume of views or opinions to inform individuals about a correct decision (Marvin et al., 2020) and produce alternative, even contradictory, policies issue. Therefore, its purpose is not necessarily the consensus or convergence of views, but the adequate clarification of any point of view or opinion expressed. Even the initial design of the questionnaire can be done in such a way as to create controversy or prevent convergence. In this research, the policy Delphi applied does not aim to generate consensus but rather to *identify* and *investigate* key policy and practice recommendations to formulate appropriate policy strategies and facilitate coherent decision making for the agri-food sector.

Several practical guidelines have been collated from existing literature to perform the Delphi study. Four major characteristics of the Delphi approach include: (i) using respondents that are experts in specific subjects, (ii) anonymizing replies, (iii) data gathering through an iterative procedure (successive rounds), and (iv) providing feedback for participants regarding the perspectives of other respondents (Huan-Niemi et al., 2016). Sampling should be purposeful: selecting informed specialists within the particular field in question rather than random selection. Each respondent equally scores statements or presents his/her ideas irrelevant to the presence of others in the sample that is achieved through successive rounds of collecting the data, maintaining anonymity among participants (Keeney et al., 2011). Accordingly, in each round, the experts’ opinions are collected, and their relative deviations from the average or prevailing views at the overall level are measured. In case of substantial deviations from the average values, the participants are informed and asked to restate and justify their views, at which point the next round of the process begins. In this way, it is possible to reduce the deviations and the result will contain the essence of all rounds of the method, eliminating the observed distortions. The method’s success lies in the fact that the whole grid of participants acts as an organism that receives stimuli and responds sequentially (Marvin et al., 2020).

Using this framework, this research conducted two rounds of online polling that lasted six months, targeting a sample of 30–55 participants for each round that was deemed appropriate. The number of experts is required to participate in a typical Delphi survey fluctuates between 10 and 30 panellists (Pare et al., 2013). The expert’s selection was based on their experience, direct involvement with the research subject, and indigenous knowledge (Rist & Dahdouh-Guebas, 2006). Accordingly, the study assembled an independent sample of experts from various disciplines, five different countries (Greece, Italy, the United Kingdom,

France, and Serbia), and various professions, incorporating actors in the whole food supply chain namely producers, retailers, food companies, processors, farmers' associations, policymakers, rural stakeholders, staff scientists (research staff of the public and private sector, teachers) and academics. Multiple steps (including identification of experts' specialization and skills, preparation of expert's database, adding more experts, ranking them on the grounds of their skills, and communication with experts) were thus followed in assembling the sample (Okoli & Pawloski, 2004).

4. Defining the dynamics of the food sector

The first round of questionnaires was sent to 108 panellists in March 2020 and the subsequent second round took place three months later. Seventy-seven experts initially completed and returned their responses from the first round (71.3%), providing an acceptable response rate. However, in all the research that applies the Delphi method, there is a low response rate of the respondents during the data collection, mainly due to continuous repetitions. Indicatively, Gargon et al. (2019) argued that in the case when large samples are studied along with surveys with more data included in each round, the response rates are very low. More details on the results provided by Mattas et al. (2020) in a Deliverable of the Strength2Food project (available at <https://www.strength2food.eu/wp-content/uploads/2020/10/D10.2-Delphi-policy-recommendations.pdf>).

The statements that obtained consensus showed that FQS labels are extremely significant primarily because of their interconnection with the rest of the economy. In particular, the bargaining power of farmers and processors may be enhanced with FQS products, generating better employment opportunities in the sectors of agriculture and processing. In addition, compared to similar products in the agri-food chain, products with FQS create higher profit per employee at the farm and processing level.

The described critical contribution of the FQS labels in economic growth and increased employment could be strengthened combined with the PSFP. It is revealed that PSFP could have significant positive impacts on the income and employment of the agri-food chain actors. This coincides the findings of Andersen et al. (2015), who claimed that procurement of school meals could provide business opportunities for food producers and industry, whose revenue stream can build upon exposing children to new healthier and sustainable foods. However, this potential is constrained by the budget restrictions of most PSFP operators.

PSFP can be further strengthened by school-based interventions to endorse healthy eating, enhance pupils' access to nutritious, balanced meals and improve their diets. Between these interventions are: (i) setting up forums of multi-stakeholders in schools to discuss meals and collaborate on the development of menus, (ii) organizing field trips in food supplier companies as an integral part of the study curriculum, (iii) evaluating and reviewing the role and progress that the catering staff may have. The specific interventions are validated in a research on the success of the school meal program in Rome (Sonnino, 2010), where it appears that the success is primarily due to the direct and effective cooperation of the stakeholders (municipalities, trade associations and the public).

Moreover, improving school meal management can lead to environmental benefits. For example, implementing better monitoring can decrease the levels of plate waste in the canteen and alleviate the meals' environmental footprint. Generally, experts argue that policies encouraging the widespread use of environmental and socio-economic criteria in awarding procurement contracts might strengthen PSFP. Nonetheless, the lack of a policy framework for the supply of soft drinks for side meals in primary schools comprises a significant weakness in fortifying the role of the PSFP. In addition, financial factors (i.e., budgetary pressures) affect food and staff costs and thus, have an adverse impact on the PSFP and place it in a precarious position.

The food sector can be boosted further through the SFSC, reinforcing mainly the relation between producers and consumers. Experts exceptionally appreciated factors related to the importance of consumers' food knowledge, the place of origin, and the key contribution of FQS to gender balance. In addition, the development of a European SFSC labeling system could effectively contribute to the strengthening of SFSCs, as it would be possible to enhance consumer recognition. However, it is documented that the seasonality of sales may hinder the development of SFSCs, whilst the reluctance of consumers to pay more for SFSCs traded food products may be also an inhibitor.

5. Policy recommendations

These food chain initiatives embody dynamic procedures requiring simple methodological tools to deliver the expected and efficient outcomes to strengthen food supply chains. A group of stakeholders in five EU countries formed these tools based on scientific results on food chain initiatives through employing a two-round hybrid Delphi framework. The main objective was to generate an integrated framework of factors/strategies that positively impact these policy systems and elements/shortcomings that hinder the expansion of the European agri-food sector. The Delphi outcomes do not conclusively verify the policy recommendations implied from previous project work, but only a cross-section of experts and stakeholders agree on them. The continuous improvement of producers, processors, retailers, and consumers in the supply chain can be achieved by reforming the current food policy framework, which will be based primarily on the sustainability of the entire food production chain.

Our participant experts agreed that, overall, FQS delivers greater profits than their economic, environmental, and social effects on rural territories. This is due to the creation of value for farmers, consumers, and the whole production system. As concerns the *farmers/producers*, the outcomes of the present work demonstrate that through FQS, they achieve the goals they have set as they have relatively higher profits due to the added value, the enhanced bargaining power in the markets and the increased employment in agriculture and food processing. However, it is worth mentioning that FQS is still a specialized activity, and to benefit a more significant portion of farmers, sales of FQS products should be increased.

In terms of the food policy framework and, in particular, the *EU policymakers*, further support for FQS could be achieved by strengthening the intra-EU trade that will improve their sales in international markets. Nonetheless, the production of public goods through FQS require coherent and coordinated European and national policies.

Nevertheless, any efforts to boost sales of FQS-labeled products may be significantly curtailed, mainly due to the *consumer's* confusion and lack of knowledge about these products. Thus, there is a need to implement policy strategies to raise consumer awareness. Shaping the food environment requires realizing an integrated policy framework for adopting coherent plans by the Member States: linking incentives to develop healthy and sustainable food production and creating new markets for labelled products. Therefore, specific communication promotions encouraging FQS are merited. To improve the effectiveness of FQS, it is imperative to converge the different food labelling systems, which are generally complex and confuse the consumers in a single market and need to be integrated into a single policy system with the ultimate goal of providing comprehensive information to consumers. Through this system and proper communication between producers and consumers, FQS can significantly be instrumental in creating a healthy and sustainable culture in food consumption.

Similarly, a cross-section of experts agrees on recommendations for actions and policy interventions to improve the environmental, economic and health outcomes of the PSFP in primary schools. The health benefits to pupils due to school meals may be enriched through relative targeted actions for school meals. On the one hand, this may be achieved through the collaborative and creative development of school menus by

multi-stakeholders concerning the supply of soft drinks for side meals in primary school. On the other hand, the benefits to society will be more apparent as an integrated PSFP can reduce the environmental impact. This can be done by shaping the relevant environmental and socio-economic criteria in the award of supply contracts and implementing explicit actions to lessen dish waste in canteens. However, enhancing the effectiveness of the PSFP in primary schools can be feasible by developing and implementing specific strategies/policies aimed at (i) increasing school meals and staffing recruitment and (ii) organizing site visits to food suppliers within schools to obtain a broad picture of the processes and the food being supplied.

Regarding SFSCs, the present research endeavour proposes specific policy steps to raise consumer awareness of the products they purchase, creating additional employment and gender balance as women contribute more to logistics activities. Bearing in mind those mentioned above, it is imperative to encourage consumer recognition of products as an integral part of consumption decisions. According to the experts, the recognition of SFSCs may be achieved by forming an integrated labelling system, ultimately targeting the transition from simple food consumption (characterized by waste) to a more responsible eating behaviour portrayed by care, responsibility, and consciousness. Nonetheless, a fundamental criterion for this transition to a more sustainable food from SFSCs is concerned consumers to become responsible citizens.

In a more general sense, the elaboration and restructuring of SFSCs is a significant parameter. Through this reform, these initiatives will be elaborated to be more economically acceptable, resilient, and more adaptable and flexible in unfamiliar conditions, such as the recent pandemic crisis. Nevertheless, an impediment to this development effort is the insufficiently designed and adapted regulatory framework and the production, processing, and sales standards. The EU institutional framework offers improved flexibility and adaptability for small production volumes but confronts the reluctance of local authorities, who either do not always know or do not always want to implement it.

In conclusion, a vague point of the research is that there is no evidence of interconnections between significant dissimilarities in the way that stakeholders in different countries discern the practicality and efficiency of these schemes. What is optimistic is that the sustainable development of these initiatives can be proved positive for the development of rural territories, but that requires a comprehensive and collaborative policy approach to their actual design and realization. Proposed policy measures should balance supply and demand. This means that the specific initiatives should be in line with consumer awareness, knowledge of these schemes, and their consistent ability to choose healthy foods and of high quality. In this regard, the critical axis of implementation is creating and realizing an institutional policy framework to remove any regulatory barriers that arise and give appropriate incentives to farmers and encourage changes in consumer behaviour to facilitate disseminating information in their training. Ultimately, the goal is to support and raise awareness of food value at all levels.

To this end, EU policymakers need to approach such issues holistically, through strategies that feature (i) the economic, environmental and socio-cultural sustainability of FQS, PSFCs and SFSCs, (ii) the participatory and collaborative decision-making process of all stakeholders in these initiatives, (iii) the existence of incentives, but also mandatory measures to make the transition to sustainable food systems more efficient and faster with improved efficiency and (iv) synchronization between productive sectors, policy areas and levels of government.

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References

- Andersen, R., Biloft-Jensen, A., Andersen, E. W., Ege, M., Christensen, T., Ygil, K. H., Thorsen, A. V., Damsgaard, C. T., Astrup, A., Michaelsen, K. F., & Tetens, I. (2015). Effects of school meals based on the new nordic diet on intake of signature foods: A randomized controlled trial. The OPUS school meal study. *British Journal of Nutrition*, 114, 772–779.
- Arfini, F., Antonoli, F., Bellassen, V., Brennan, M., Fumel, M., Gorton, M., Hartmann, M., Hawes, D. R., Mancini, M. C., Roos, G., Schüssler, J., Tocco, B., Torjusen, H., Tregear, A., Veneziani, M., Virginie, A., Vittersø, G., & Yeh, C. (2016). Working paper on the conceptual framework and literature review for understanding the social, environmental and economic impact of FQS, SFSC and varying PSFP policies on agri-food chain participants and rural territories. *Strength2food deliverable*. <https://www.strength2food.eu/publications/>.
- Arfini, F., & Mancini, M. C. (2018). Synergies between localized agri-food systems and short supply chains for geographical indications in Italy. In A. Kalfagianni, & S. Skordili (Eds.), *Localizing global food* (pp. 104–120). London: Routledge.
- Arfini, F., Mancini, M. C., & Donati, M. (2012). *Local agri-food systems in a global world: Market, social and environmental challenges*. Newcastle Upon Tyne: Cambridge Scholars Publishing.
- Barham, E., & Sylvander, B. (Eds.). (2011). *Labels of origin for food: Local development, global recognition*. Wallingford: CAB International.
- Bellassen, V., Giraud, G., Hilal, M., Arfini, F., Barczak, A., Bodini, A., Brennan, M., Drut, M., Dubois de Labarre, M., Gorton, M., Hartmann, M., Majewski, E., Monier-Dilhan, S., Muller, P., Poméon, T., Tocco, B., Tregear, A., Veneziani, M., Vergote, M.-H., ... Wilkinson, A. (2016). Report detailing the methods and indicators for measuring the social, environmental and economic impacts of FQS, SFSC and varying PSFP policies on agri-food chain participants and rural territories. [Research Report] European Union's Horizon 2020 research and innovation programme.
- Belletti, G., Marescotti, A., & Touzard, J. M. (2017). Geographical indications, public goods, and sustainable development: The roles of actors' strategies and public policies. *World Development*, 98, 45–57.
- Bonadonna, A., Macar, L., Peira, G., & Giachino, C. (2017). The dark side of the European quality schemes: The ambiguous life of the traditional specialties guaranteed. *Food Safety Management*, 18(No. 156), 102–108. February 2017.
- Chiffolleau, Y., & Dourian, T. (2020). Sustainable food supply chains: Is shortening the answer? A literature review for a research and innovation agenda. *Sustainability*, 12, 9831. <https://doi.org/10.3390/su12239831>
- Du, C. J., & Sun, D. W. (2006). Learning techniques used in computer vision for food quality evaluation: A review. *Journal of Food Engineering*, 72(1), 39–55.
- European Parliament and Council of the European Union. (2014). Directive 2014/24/EU of the European parliament and of the Council of 26 february 2014 on public procurement and repealing directive 2004/18/EC. *Orkesterjournalen L*, 94, 2014, 28.3.
- Gaitán-Cremaschi, D., Klerkx, L., Duncan, J., et al. (2019). Characterizing diversity of food systems in view of sustainability transitions. A review. *Agronomy for Sustainable Development*, 39, 1. <https://doi.org/10.1007/s13593-018-0550-2>
- Short food supply chains as drivers of sustainable development. In Galli, F., & Brunori, G. (Eds.), *Evidence document. FP7 project Foodlinks (GA No. 265287)*, (2013). Laboratorio di studi rurali Sismondì.
- Galli, F., Brunori, G., Di Iacovo, F., & Innocenti, S. (2014). Co-producing sustainability: Involving parents and civil society in the governance of school meals services. A case study from pisa, Italy. *Sustainability*, 6, 1643–1666.
- Gargon, E., Crew, R., Burnside, G., & Williamson, P. R. (2019). Higher number of items associated with significantly lower response rates in COS Delphi surveys. *Journal of Clinical Epidemiology*, 108, 110–120.
- Huan-Niemi, E., Rikkinen, P., Niemi, J., Wuori, O., & Niemi, J. (2016). Combining quantitative and qualitative research methods to foresee the changes in the Finnish agri-food sector. *Futures*, 83, 88–99.
- Jünger, S., Payne, S. A., Brine, J., Radbruch, L., & Brearley, S. G. (2017). Guidance on conducting and reporting Delphi studies (CREDES) in palliative care: Recommendations based on a methodological systematic review. *Palliative Medicine*, 31(8), 684–706.
- Keeney, S., McKenna, H., & Hasson, F. (2011). *The Delphi technique in nursing and health research*. West Sussex: Wiley.
- Kneafsey, M., Venn, L., Schmutz, U., Balázs, B., Trenchard, L., Eyden-Wood, T., Bos, E., Sutton, G., & Blackett, M. (2013). *Short food supply chains and local food systems in the EU: A state of play of their socio-economic characteristics. jrc scientific and policy reports*. Report EUR 25911.
- Luning, P., & Marcelis, W. (2007). A conceptual model of food quality management functions based on a techno-managerial approach. *Trends in Food Science & Technology*, 18(1), 159–166.
- Mancini, M. C., & Arfini, F. (2018). Short supply chains and protected designations of origin: The case of Parmigiano Reggiano (Italy). *Ager. Revista de Estudios sobre Despoblación y Desarrollo Rural*, 2018(25), 43–64.
- Marvin, H. J. P., van Asselt, E., Kleter, G., Meijer, N., Lorentzen, G., Johansen, L., Hannisdal, R., Sele, V., & Bouzembrak, Y. (2020). Expert-driven methodology to assess and predict the effects of drivers of change on vulnerabilities in a food supply chain: Aquaculture of Atlantic salmon in Norway as a showcase. *Trends in Food Science & Technology*, 103, 49–56.
- Mattas, K., & Tsakiridou, E. (2010). Shedding fresh light on food industry's role: The recession's aftermath. *Trends in Food Science & Technology*, 21, 212–216.
- Mattas, K., Tsakiridou, E., Karelakis, C., Lazaridou, D., Chousou, C., Veneziani, M., Tregear, A., Gorton, M., Tocco, B., Saidi, M., & Filipović, J. (2020). Development, refinement and verification of policy recommendations. *Strength2food deliverable*. <https://www.strength2food.eu/publications/>.

- Mercado, G., Hjortso, C., & Kledal, P. (2016). Public procurement for school breakfasts in the Bolivian altiplan: Governance structures enabling smallholder inclusion. *Journal of Rural Studies*, 44, 63–76.
- Motarjemi, Y., & Mortimore, S. (2005). Industry's need and expectations to meet food safety. 5th International meeting: Noordwijk food safety and HACCP forum 9-10 December 2002. *Food Control*, 16(6), 523–529.
- Okoli, C., & Pawloski, S. (2004). The Delphi method as a research tool: An example, design considerations and applications. *Information & Management*, 42, 15–29.
- Oostindie, H., van Broekhuizen, R., de Roest, K., Belletti, G., Arfini, F., Menozzi, D., & Hees, E. (2016). Sense and non-sense of local-global food chain comparison, empirical evidence from Dutch and Italian pork case studies. *Sustainability*, 8(4), 319.
- Oostindjer, M., Aschemann-Witzel, J., Wang, Q., Skuland, S. E., Egelandssdal, B., Amdam, G. V., Schjøll, A., Pachucki, M. C., Rozin, P., Stein, J., Lengard Almlil, V., & Van Kleef, E. (2017). Are school meals a viable and sustainable tool to improve the healthiness and sustainability of children's diet and food consumption? A cross-national comparative perspective. *Critical Reviews in Food Science and Nutrition*, 57(18), 3942–3958.
- Pare, G., Cameron, A. F., Poba-Nzaou, P., & Templier, M. (2013). A systematic assessment of rigour in information systems ranking-type Delphi studies. *Information & Management*, 50(5), 207–217.
- Rist, S., & Dahdouh-Guebas, F. (2006). Ethnoscience-A step towards the integration of scientific and indigenous forms of knowledge in the management of natural resources for the future. *Environment, Development and Sustainability*, 8, 467–493.
- Soares, P., Martinelli, S. S., Melgarejo, L., Davó-Blanes, M. C., & Cavalli, S. B. (2015). Strengths and weaknesses in the supply of school food resulting from the procurement of family farm produce in a municipality in Brazil. *Ciência & Saúde Coletiva*, 20(6), 1891–1900.
- Sonnino, R. (2010). Escaping the local trap: Insights on relocalization from school food reform. *Journal of Environmental Policy and Planning*, 12(1), 23–40.
- Strasser, A. (2017). Delphi method variants in information systems research: Taxonomy development and application. *Electronic Journal of Business Research Methods*, 15(2), 120–133.
- Tikkanen, I. (2014). Procurement and consumption of local and organic food in the catering of a rural town. *British Food Journal*, 116(3), 419–430.
- Union, E. (2013). Regulation (EU) No. 1305/2013 of the European parliament and of the Council on support for rural development by the European agricultural fund for rural development (EAFRD) and repealing Council regulation (EC) No. 1698/2005. *Official Journal of the European Union L*, 347, 487–548.
- Vandecastelaere, E., Arfini, F., Belletti, G., & Marescotti, A. (Eds.). (2011). *Linking people, places and products: A guide for promoting quality linked to geographical origin and sustainable geographical indications* (2nd ed.). Rome: Food and Agriculture Organization of the United Nations.
- Vittersø, G., Torjusen, H., Laitala, K., Tocco, B., Biasini, B., Csillag, P., Dubois de Labarre, M., Lecoeur Jean-Loup Maj, A., Majewski, E., Malak-Rawlikowska, A., Menozzi, D., Török, A., & Wavresky, P. (2019). Short food supply chains and their contributions to sustainability: Participants' views and perceptions from 12 European cases. *Sustainability*, 11, 4800. <https://doi.org/10.3390/su11174800>
- Zecca, F., & Rastorgueva, N. (2014). Supply chain management and sustainability in agri-food system: Italian evidence. *Journal of Nutritional Ecology and Food Research*, 2, 20–28.
- Zmija, K., Czekaj, M., & Zmija, D. (2019). The role of small farms in local food systems annals of the polish association of agricultural and agribusiness economists. *Annals Paae •, Xxi •*(4). <https://doi.org/10.5604/01.3001.0013.5527>, 2019.