

## Environmental Sustainability Aspects in Short Food Supply Chains: the Views of Organic Farmers and Consumers

**\*Maija Ušča, Lāsma Aleksejeva**

Institute of Agricultural Resources and Economics, Department of Bioeconomics  
 14 Struktoru street, Riga, Latvia

**Abstract.** Globally, food systems are the most significant cause of environmental change; therefore, efforts to create more environmentally sustainable food systems are presented. One of the directions is strengthening the local actors and short food supply chains. Simultaneously, changes in farming systems are needed, and organic agriculture is one of the ways to make food systems more environmentally sustainable. Despite the abundance of research on the environmental consciousness of consumers in short food supply chains, the question is raised whether local food chain farmers are also committed to environmental sustainability. Therefore, this paper aims to explore the importance of environmental sustainability to organic short food supply chain actors. More specifically, the research depicts the views of organic farmers and consumers and their relation to the actual environmental sustainability of short food supply chains. During the research, a specific short food supply chain – a direct purchasing network – was explored. A qualitative approach was applied to reach the aim. Thus, in-depth interviews and observations were used as a research method. The research results demonstrated the views of farmers and consumers of the specific network regarding environmental sustainability aspects in the network. In the research, such environmental aspects as the circularity of resources, biodiversity, chemicals in the environment, seasonality and locality of diets, and the distance (food miles) were admitted as crucial ones by the specific short food supply chain actors. The differences in opinions of consumers and farmers emerged when thinking about the scale of their views.

**Key words:** organic agriculture, alternative food networks, short food supply chains, sustainable food systems, environmental sustainability, Latvia, Eastern Europe.

### Introduction

Food systems intensively use global resources and are the most significant cause of global environmental change. The food production stage alone is responsible for about 30% of global greenhouse gas emissions, 70% of freshwater use (Willett et al., 2019), about 30% of global terrestrial acidification, and 78% of eutrophication (Poore & Nemecek, 2019). Food systems face challenges regarding industrialised production and long, non-transparent distribution practices (Vittersø et al., 2019). Thus, efforts to create more sustainable and just food systems differing from conventional food production and distribution are implemented (Nemes et al., 2023). During the last years also, customers have started to question the global food systems and are looking for alternative food chains (González-Azcárate et al., 2021; Miškolci,

2017). In practice, these alternative food networks, attempting to alter how individuals manufacture and consume food (Paciarotti & Torregiani, 2021), are predominantly functioning in the form of short food supply chains (SFSC) (Benos et al., 2022).

The requirement for food systems that are more environmentally friendly and enduring is set as an aim by the European Union (EU) as well in the strategies implemented in 2020 – the Biodiversity Strategy to bring nature back into our lives (European Commission, 2020b) and the Farm to Fork Strategy for a fair, healthy and environmentally friendly food system (European Commission, 2020a). These strategies bring together farmers, consumers, nature, and businesses to work jointly for more sustainable future food systems. The Farm to Fork Strategy emphasises the importance of providing consumers

\* Corresponding Author's email:  
 maija.usca@arei.lv

DOI: 10.2478/plua-2023-0018

© 2023 M.Usca et al. This is an open access article licensed under the Creative Commons Attribution-NonCommercial-NoDerivs License (<http://creativecommons.org/licenses/by-nc-nd/3.0/>).

with safe, healthy, high-quality, and affordable food while also supporting environmental objectives such as decreasing reliance on pesticides and antimicrobials, minimising excessive fertilisation, promoting organic farming, enhancing animal welfare, and reversing the decline in biodiversity (European Commission, 2020a).

In contrast to conventional agriculture, organic agriculture adopts farming practices that try to prioritise nature and the environment. It prohibits the use of pesticides and genetically modified crops and restricts the use of antibiotics. Studies indicate that areas cultivated using organic farming methods exhibit several environmental benefits. They can have greater biodiversity (Tuck et al., 2014), reduced water pollution (Cambardella et al., 2015; Ušča et al., 2023), lower levels of pesticide residues in the soil (Geissen et al., 2021), and maintained natural soil fertility (Stubenrauch et al., 2021). Organic food items are also closely linked to enhancements in food quality as they exhibit lower levels of pesticide residues and heavy metals than conventional food (Johansson et al., 2014; Montiel-León et al., 2019). Still, organic farming alone is not a solution to all global environmental problems furthered by food systems, as reducing the pressure from production alone is not enough to solve the international situation (Röös et al., 2021).

The abovementioned tendencies in food systems are also shaping farmers' and consumers' views and food production/buying behaviour – they are also becoming more aware of environmental issues of the food systems (Aouinaït et al., 2022; Michel-Villarreal et al., 2020). Research shows that environmental consciousness affects food purchasing behaviour (Benos et al., 2022). In more detail, food purchasing through SFSC is related to consumers' pro-environment attitude (Cicia et al., 2021). But still, questions are raised about whether local food chain farmers are also committed to environmental sustainability (Schoolman et al., 2021). The amount of research on all short and alternative food chain actors is also minimal (Michel-Villarreal et al., 2019).

Therefore, this paper aims to explore what aspects of environmental sustainability are essential to organic SFSC actors – farmers and consumers – and how these aspects relate to the actual environmental sustainability of SFSC. Thus, this article adds to our comprehension and discourse regarding the potential impact of SFSC in the shift toward environmentally sustainable food systems. It also delves into the less-explored aspect of SFSC farmers' dedication to environmental sustainability. This research also adds to the scarcity of studies on short food supply chains in Eastern Europe, thus advancing a comprehensive and academically diverse discussion about contemporary

food systems in Europe in terms of geography and scholarly contributions (Jehlička et al., 2020).

Short food supply chains (SFSC), as an alternative to globalised food chains, exist in different forms (Galli & Brunori, 2013). The forms of SFSC vary in different EU countries, from direct sales (Kiss et al., 2019), farmers' markets and food box schemes (Michel-Villarreal et al., 2020) to direct-to-institution partnerships (Schoolman et al., 2021), and others. On average, 46% of EU consumers have admitted that it is very important to them that the food they buy is part of a short food supply chain, while for 41%, this aspect is fairly important. Simultaneously, in Latvia, 36% of respondents have admitted that the element of SFSC is very important to them, while for 45%, it is fairly important (European Commission, 2022).

In the literature, food supply chains have been conceptualised as chains that have three types of proximity – geographical, social, and organisational (Malak-Rawlikowska et al., 2019). Geographical proximity refers to the distance between farmers and consumers (Paciarotti & Torregiani, 2021). Organisational proximity refers to the reduced number of intermediaries between farmers and consumers (Jarzebowski et al., 2020) – zero to one intermediary (Malak-Rawlikowska et al., 2019), while social proximity is closely connected to the organisational one and refers to a relationship, involving trust and familiarity, between food chain actors (Dubois, 2018).

SFSC can be seen as an alternative form of consumption to the globalised agri-food model (Galli & Brunori, 2013; González-Azcárate et al., 2021), widely believed to be more sustainable compared to large-scale food distribution systems (Malak-Rawlikowska et al., 2019). Simultaneously, there are discussions about the pros and cons to the environment of the short food supply chains. Regarding environmental sustainability of food chains, the criteria of ecosystem services, biodiversity, the low ecological footprint of transport, reduction of food loss and waste, as well as low environmental impact of retailers have been studied (Reina-Usuga et al., 2023). In other research, it is admitted that the environmental advantages of SFSC can relate to two food chain stages – the production stage, depicting the aspects of how food is grown, and the distribution stage, representing how the food gets to the people who eat it (Schoolman, 2019).

When referring to the benefits of environmental sustainability of SFSC, it is admitted that they present advantages to this in some situations (Galli & Brunori, 2013). As the SFSC products travel shorter distances from the place of production to the place of consumption, potential benefits could be gained from the shorter distances. This aspect is depicted through

the concept of food miles – the distance between the places of production and consumption (Kiss et al., 2019). In SFSC, the food miles are shorter. Therefore, the environment could benefit from reduced carbon dioxide emissions or diminished noise pollution (Tudisca et al., 2015). Still, in more recent research, it was admitted that SFSC are often characterised by higher food mile values and a higher carbon footprint due to the small quantities of food products transported (Malak-Rawlikowska et al., 2019), counted per vehicle or unit of energy (González-Azcárate et al., 2021).

The whole food system contributes to global environmental problems, but the agricultural stage is where the most significant environmental impacts occur (Dalin & Outhwaite, 2019; Garnett, 2014). Therefore, when referring to the benefits to environmental sustainability of SFSC, the agricultural methods should be discussed, e.g., the application of farming substances to control pests, weeds, and diseases (Schoolman, 2019). The SFSC approach does not include the changes in farming methods, and there is no evidence that local farmers a priori would more likely adhere to more sustainable farming methods, e.g., organic, biodynamic, or other (Schoolman et al., 2021). Thus, although the environmental benefits of short food supply chains are questioned, researchers are admitting that it is also crucial to consider the positive results of SFSC on the environment through spillover effects, e.g., rural development (González-Azcárate et al., 2021).

## **Materials and Methods**

In the research, a qualitative approach was used because of the exploratory nature of the study as well as its aim to explore in-depth the views of short supply chain actors. Thus, qualitative interviews and observations were used as research methods.

The research was carried out in one specific short food supply chain – a direct purchasing (DP) network in Latvia characterised by clear boundaries. This network is comprised of organic farmers and consumers organised around designated product distribution locations (distribution spots). These locations, often in office rooms, community centres, private garages, or basements, serve as collection points where farmers deliver pre-ordered organic products at agreed-upon times. Convening at these specific spots, consumers collect their ordered products (Ušča & Tisenkopfs, 2023).

During the research, 16 in-depth interviews with DP network actors were carried out, including six interviews with farmers and ten interviews with consumers, four of whom were also DP distribution spot organisers. Potential interviewees were contacted through e-mail and telephone for participation in

the interview. Four interviews were conducted with farmers at their farms, one at a DP distribution point in Riga during product delivery, and one interview was conducted online for safety considerations. The consumer interviews occurred at their homes, working places or DP distribution spots. The interviews lasted for 25–70 minutes. They were recorded, transcribed, and afterwards coded for thematic analysis.

The interview questions, among others that are not analysed in this article, included aspects of the interviewees' interests and motivations to take part in the DP network as well as aspects they appreciate in the DP network. To understand the interviewees' own views and ideas, the interviewer didn't mention the (potential) aspects of environmental sustainability; thus, the results reflect the specific ideas of respondents and are not affected by the questions asked or pre-raised categories of environmental sustainability of SFSC.

Observations were made during farm visits and interviews with farmers. The author of the research also participated in the DP network in a distribution spot in Riga and worked as a volunteer there as well, thus getting the possibility to meet the farmers and consumers there.

## **Results and Discussion**

### *The DP network*

The DP network was established 15 years ago as an initiative of a young family. The aim of it was to supply local, fresh, organic products for the family, who was living in the capital of Latvia – Riga. Although the first farmers' markets formed in Riga around 2000, even in 2008, it was not easy to access local organic products (Ušča & Tisenkopfs, 2023). The DP network originated as a modest partnership involving a limited number of consumers and organic farmers. Over a few years, it evolved into a fully operational food distribution network encompassing organic farms, consumers, and distribution points (Bankovska, 2020). In 2022, there were 16 functioning DP distribution spots, 11 of which were situated in Riga and the other five – in towns outside Riga. In 2022, 93 organic farms participated in the DP network and delivered organic products to the distribution spots.

An online product ordering system is used in the DP network to ensure its operation. Once a week until the pre-arranged date and time, consumers order products from the organic farms involved in the DP network through this system. Afterwards, at the pre-arranged day and time, organic farmers bring the products to the distribution spots, where consumers later gather them. It is crucial to mention that consumers also have the role of volunteers in this network. As volunteers, the main task is organising the product ordering and

Table 1

**Consumers' and farmers' views of the environmental sustainability of SFSC – DP network**

| Topics                                        | Summary of findings                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Circularity                                   | <ul style="list-style-type: none"> <li>- understanding of an option to use leftovers as a resource, often using leftovers from animal husbandry in crop production and vice versa (farmers)</li> <li>- reuse and refilling of packaging as a step towards circularity and waste reduction (farmers and consumers)</li> </ul> |
| (Bio)diversity                                | <ul style="list-style-type: none"> <li>- referring to variety / product diversity in the farm and DP network (farmers and consumers)</li> <li>- nature protection (farmers)</li> </ul>                                                                                                                                       |
| Fewer chemicals in the environment/<br>nature | <ul style="list-style-type: none"> <li>- fewer chemicals in the environment due to the practices of organic agriculture (farmers and consumers)</li> <li>- pollution reduction in the soil, water, and surrounding environment (farmers)</li> <li>- nature protection (farmers)</li> </ul>                                   |
| Seasonality (and<br>locality) of diet         | <ul style="list-style-type: none"> <li>- eating seasonal products available through the DP network (consumers)</li> </ul>                                                                                                                                                                                                    |
| Distance (food miles)                         | <ul style="list-style-type: none"> <li>- focus on the idea of a shorter distance from the place of production to the place of consumption / locality of food (consumers)</li> <li>- cooperation in product delivery to distribution spots (farmers)</li> </ul>                                                               |

receiving process. Therefore, they must allocate their time as volunteers within the DP network every few weeks.

*The views of organic farmers and consumers on environmental sustainability aspects in SFSC*

Several environmental sustainability aspects regarding the DP network as an SFSC were depicted during the research. The summary of environmental sustainability aspects mentioned by DP network actors – organic farmers and consumers – is displayed in Table. 1, including circularity in the DP network and farms, diversity, chemicals in the environment, seasonality and locality of diets, and the distance from the place of the farm to the place of consumers.

#### Circularity

The aspect of circularity was mentioned as a crucial one both by farmers and consumers. The farmers pointed at circularity in their farms by using leftovers and even waste as a resource. Usually, they used leftovers and waste from one sector, e.g., animal husbandry, in another industry, e.g., crop production or vice versa. The mentioned examples of circularity included but were not limited to animal manure use in agriculture, and feeding animals with weeds from the garden or vegetable peels.

*“We have the so-called no-residue farming. In principle, we try to grow everything (food) for ourselves and the animals (...). We feed the chickens with everything – all the weeds that*

*we have here in the greenhouse. We also take everything we uproot from the field.” (Farmer)*

These aspects of circularity were possible due to the multi-sectoral farming, including crop production and animal husbandry on the farms. In Latvia, nearly 20% of all organic farms in 2020 were specialising in mixed crop and animal husbandry (Benga, 2022). In other research, crop and livestock farming interaction has been mentioned as crucial in fostering circularity because livestock is also characterised as an agent that can convey nutrients from grassland to arable land (Billen et al., 2021). Using leftovers is also connected to the environmental benefit of reducing food wastage (Rivera-Ferre et al., 2021). Thus, circularity in the DP network also contributes to the diminished use of resources.

The aspect of circularity in the DP network also manifested through the reuse and refilling of packaging and efforts to reduce the overall packaging of the products in the network. Consumers mentioned their wish to decline the plastic packaging and promote reusable packaging. Some farms introduced special reusable boxes for greens; others used glass jars for dairy products, jams, and other products. Some farms took back the egg cartons for reuse. Regarding packaging aspects of food and circularity, not only reusability, recycling and reduction of packaging should be taken into account, and also the number of food losses and waste related to packaging (Kiss et al.,

2019). This aspect is crucial because packaging keeps the food fresh longer and helps to protect it from being lost or wasted (Pauer et al., 2019). Here, we have to mention that this aspect of packaging was not explicitly mentioned in the interviews but was observed by the authors among DP network consumers – they praised the thoughtful packaging, which allowed the products to stay fresh longer.

#### (Bio)diversity

When considering food system environmental sustainability, biodiversity is often mentioned (Brunori et al., 2016; Hansmann et al., 2020; Poore & Nemecek, 2019). Here, we have to note that the diversity of varieties is also crucial because biodiversity in rural areas is created not only by wild plants but also by richness in variety of cultivated plants (Berbec & Feledyn-Szewczyk, 2018). In our research, consumers and farmers mentioned the aspects of product and variety diversity as crucial to them. They contrasted the greater diversity of products with the standardised food in the supermarkets. Consumers expressed their gratitude to the farmers and were surprised that so many products are grown in local organic farms.

*“And when we received [the DP products], then, “Look! Is it all local? Really?” because everything nowadays is so standardised in the stores.” (Consumer)*

Simultaneously, there are not only different kinds of products grown but also different varieties of one product grown on one farm. In particular, a farm growing 80 different kinds of tomato varieties and ten different potato varieties must be mentioned. As a crucial aspect, the farmers named the possibility to sell different types of non-standard-looking products through the DP network, thus reducing the potential food waste. Our finding is consistent with other researchers saying that typically, smaller-scale distribution channels offer more variety and are not afraid to try new things (Milford et al., 2021).

#### Fewer chemicals in the environment/nature

The aspect of fewer environmental chemicals is characterised by the chosen farming method – organic agriculture. As in the DP network, only organic farms and farms in the transition process to organic are involved. Most of the consumer respondents admitted the organicity of products to be crucial. They referred to organic agriculture as being more friendly to nature and the environment, and believed that products managed organically are healthier. Farmers referred to organic agriculture as one that helps them keep their land, soil and surrounding waters clean and unpolluted.

*“We want to protect the nature in which we live, and that is what we continue to do. [Managing the land] according to nature,*

*and then it doesn't seem to be a burden; it just seems normal.” (Farmer)*

We have to mention that all interviewed farmers lived at the same place where they were farming thus, they were motivated to keep the surrounding environment of their place of residence clean. As the standard output of 90% of organic farms in Latvia is less than 25 000 euro, they are considered to be small farms and can be considered to be family farms (Benga, 2022), and thus, most probably, they are often living in the same place as they are farming. It has been admitted that on the EU level, farms selling their products through SFSC are mostly small (Augère-Granier, 2016).

#### Seasonality of diets

When referring to the aspects of diets, we have to mention that local production entails the presence of seasonal variations and a restricted variety of food products (González-Azcárate et al., 2021). This aspect was mentioned in the interviews with consumers as well because seasonality of products is very palpable.

*“I learned the seasonality of products in the DP network, which was very crucial to me at one point.” (Consumer)*

The respondents referred to seasonal diets as a sustainable food consumption practice, consistent with other researches admitting that consuming seasonal fruit and vegetables is a sustainable eating behaviour (Tari Selcuk et al., 2023). The seasonality of products in the DP network refers to different product categories. Greens are available in spring and summer, specific vegetables and berries in summer, and vegetables that can be stored for more extended periods (potatoes, carrots, beetroots, kale, parsnips, pumpkins, and others) in autumn and also winter. There are specific periods of the year when cows and goats cannot be milked, therefore the availability of dairy products is limited. Such periods also characterise the laying period of hens. Still, the farmers try to extend the product availability period, e.g., by alternately planning the non-laying period of the hens with introducing the category of frozen products (e.g., berries) and pickles.

The aspect of seasonal eating characterises not only SFSC but also other practices connected to home gardening and food self-sufficiency, e.g., in recent research, it was deduced that community gardening was related to increased seasonal eating (Alaimo et al., 2023).

#### Distance (food miles)

The aspect of distance from the place of product production to the place of product consumption manifested through the consumers' idea that local products are more environmentally friendly due to the shorter distance travelled. As mentioned previously,

products in short and alternative networks are often characterised by higher food miles (González-Azcárate et al., 2021). Still, this conclusion is not self-evident as there has been discussion in the scientific community about this aspect as well. The farmers admitted that longer distances to the products' distribution points encourage them to cooperate with their transportation.

The consumers mentioned a spillover effect of buying local products, admitting that it is crucial to them to support local organic farmers and pay their money for the local organic products, thus furthering regional economics. Support to the local economy as an essential social benefit that motivates consumers to buy food through SFSC has also been mentioned previously (Mass et al., 2022). But in our study, the focus is not only on the local economy but also on organic agriculture. Thus, the social gains that manifest through the support to local organic farmers are supplemented with environmental benefits because of the more environmentally friendly farming methods used by organic farmers.

#### Perceived environmental aspects in the DP network

The perceived benefits to the environment due to the selected food supply channel – the DP network – include five topics: the aspects of circularity of resources in the DP network and farms, diversity, chemicals in the environment, seasonality and locality of diets, as well as the distance from the place of the farm to the place of consumers. Two of them are directly connected to the shortening of the food chain – seasonality and locality of diets, as well as the distance from the place of food production to the place of consumers.

The aspects of diversity and fewer chemicals in the environment are due to the farmers' organic farming practices, which are not directly connected to the SFSC. In the DP network, the organic origin of the food has been one of the core values since the formation of the network, and consumers admitted they believe organic food is healthier than conventional. This finding is consistent with other research admitting the perceived notion of consumers that organic food is more environmentally friendly and healthier (Brantsæter et al., 2017). Besides others, the mentioned importance of circularity in the DP network points at the overall pro-environmental attitude of the consumers of the DP network, confirming previous research results on pro-environmental attitudes and food purchasing through SFSC (Cicia et al., 2021).

Both consumers as well as farmers mentioned different environmental aspects as crucial to them when thinking of food supply and distribution practices through the DP network. Still, we must admit that the depicted views of farmers were more local and individual, e.g., when referring to more

environment and nature-friendly farming methods, they realised they did not want to pollute their place of living. Simultaneously, consumers referred to both the individual level and broader views – national and global level benefits to the environment.

## **Conclusions**

Organic agriculture and food supply through short food supply chains are considered, at least in some aspects, to be promising approaches for creating more sustainable food systems. The food chain actors are also becoming more aware of sustainability issues, including environmental sustainability. In the research, we explored the aspects of environmental sustainability that are important to organic SFSC actors. We presented the insights from an organic SFSC – the DP network in Latvia. Through this study we demonstrated the views of farmers and consumers of the specific network regarding environmental sustainability aspects in the network. In the research, the elements of circularity in the DP network and farms, (bio and product) diversity, fewer chemicals in the environment (organic agriculture), seasonality and locality of diets, as well as the distance from the place of farm to the place of consumers (food miles) were admitted as crucial ones by the SFSC actors. The differences in opinions of consumers and farmers emerged when thinking about the scale of their views – farmers depicted their views more on a local scale, while consumers – on a national and global scale.

There were specific environmental aspects, admitted as being crucial by both groups of actors, that were not strictly linked to SFSC, e.g. the aspect of fewer chemicals in the environment is closely related to the method of farming – in this case, organic agriculture – not to the length of the food chain. Also, the aspect of circularity can manifest through longer food chains, e.g., zero-waste shops. Thus, in this research, we can also discuss a broader pro-environmental attitude of SFSC consumers.

The study's main limitations were associated with the specific nature of the explored network – it was an organic SFSC. Due to the needed typical consumer engagement in the network – volunteering – only a particular section of society could be interested in participating in the network, which can also affect their views of environmental sustainability.

## **References**

- Alaimo, K., Beavers, A. W., Corinrato, E., Lacy, K., Ma, W., Hurley, T. G., & Hébert, J. R. (2023). Community Gardening Increases Vegetable Intake and Seasonal Eating From Baseline to Harvest: Results from a Mixed

- Methods Randomized Controlled Trial. *Current Developments in Nutrition*, 7(5). DOI: 10.1016/j.cdnut.2023.100077.
- Aouinaït, C., Christen, D., Carlen, C., Massri, C., Reipurth, M., Hieke, S., Hegyi, A., Kujáni, K., Major, Á., Fricz, Á. S., Hüttl-Maack, V., Gawlik, D., Petropoulou, E., Alfaro, B., Cruz, E. S., Lameris, M., Kuitens, A., Janssen, F., Braun, S., & Chang, B. (2022). Barriers and Facilitators of Purchasing from Short Food Supply Chains in Europe: Insights from a Stakeholder Perspective. *International Journal of Food Studies*, 11(July), 196–207. DOI: 10.7455/ijfs/11.SI.2022.a6.
- Augère-Granier, M.-L. (2016). Short food supply chains and local food systems in the EU. *European Parliamentary Research Service*, 1–10. [https://www.europarl.europa.eu/RegData/etudes/BRIE/2016/586650/EPRS\\_BRI\(2016\)586650\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2016/586650/EPRS_BRI(2016)586650_EN.pdf)
- Bankovska, A. (2020). *Patchworks of Care: Ethics and Practice of Care in the Organic Food Movement in Latvia* (Issue November), University of Helsinki.
- Benga, E. (2022). *Ziņojums Lauku attīstības programmas 2014 -2020 novērtēšanas ietvaros Bioloģiskās lauksaimniecības situācijas analīze un SVID / Report within the evaluation of the Rural Development Program 2014-2020 Analysis of the situation of organic agriculture and SW*. 1–41., Riga, Latvia.
- Benos, T., Burkert, M., Hüttl-Maack, V., & Petropoulou, E. (2022). When mindful consumption meets short food supply chains: Empirical evidence on how higher-level motivations influence consumers. *Sustainable Production and Consumption*, 33, 520–530. DOI: 10.1016/j.spc.2022.07.028.
- Berbec, A. K., & Feledyn-Szewczyk, B. (2018). Biodiversity of weeds and soil seed bank in organic and conventional farming systems. *Research for Rural Development*, 2(December), 12–19. DOI: 10.22616/rdd.24.2018.045.
- Billen, G., Aguilera, E., Einarsson, R., Garnier, J., Gingrich, S., Grizzetti, B., Lassaletta, L., Le Noë, J., & Sanz-Cobena, A. (2021). Reshaping the European agro-food system and closing its nitrogen cycle: The potential of combining dietary change, agroecology, and circularity. *One Earth*, 4(6), 839–850. DOI: 10.1016/j.oneear.2021.05.008.
- Brantsæter, A. L., Ydersbond, T. A., Hoppin, J. A., Haugen, M., & Meltzer, H. M. (2017). Organic Food in the Diet: Exposure and Health Implications. *Annual Review of Public Health*, 38(November), 295–313. DOI: 10.1146/annurev-publhealth-031816-044437.
- Brunori, G., Galli, F., Barjolle, D., van Broekhuizen, R., Colombo, L., Giampietro, M., Kirwan, J., Lang, T., Mathijs, E., Maye, D., de Roest, K., Rougoor, C., Schwarz, J., Schmitt, E., Smith, J., Stojanovic, Z., Tisenkopfs, T., & Touzard, J. M. (2016). Are local food chains more sustainable than global food chains? Considerations for Assessment. *Sustainability (Switzerland)*, 8(5), 1–27. DOI: 10.3390/su8050449.
- Cambardella, C. A., Delate, K., & Jaynes, D. B. (2015). Water Quality in Organic Systems. *Sustainable Agriculture Research*, 4(3), 60. DOI: 10.5539/sar.v4n3p60.
- Cicia, G., Furno, M., & Del Giudice, T. (2021). Do consumers' values and attitudes affect food retailer choice? Evidence from a national survey on farmers' market in Germany. *Agricultural and Food Economics*, 9(1). DOI: 10.1186/s40100-020-00172-2.
- Dubois, A. (2018). Nurturing proximities in an emerging food landscape. *Journal of Rural Studies*, 57(October 2017), 1–12. DOI: 10.1016/j.jrurstud.2017.10.005.
- European Commission. (2020a). *A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system*. European Commission.
- European Commission. (2020b). *EU Biodiversity Strategy for 2030 Bringing nature back into our lives*. European Commission.
- European Commission. (2022). *Europeans, agriculture and the CAP. March*, 169. Eurobarometer survey, European Commission.
- Galli, F., & Brunori, G. (2013). Short food supply chains as drivers of sustainable development. In *Evidence Document*. Document Developed in the Framework of the FP7 Project FOODLINKS; (GA No. 265287).
- Geissen, V., Silva, V., Lwanga, E. H., Beriot, N., Oostindie, K., Bin, Z., Pyne, E., Busink, S., Zomer, P., Mol, H., & Ritsema, C. J. (2021). Cocktails of pesticide residues in conventional and organic farming systems in Europe – Legacy of the past and turning point for the future. *Environmental Pollution*, 278, 116827. DOI: 10.1016/j.envpol.2021.116827.
- González-Azcárate, M., Cruz Maceín, J. L., & Bardají, I. (2021). Why buying directly from producers is a valuable choice? Expanding the scope of short food supply chains in Spain. *Sustainable Production and Consumption*, 26, 911–920. DOI: 10.1016/j.spc.2021.01.003.
- Hansmann, R., Baur, I., & Binder, C. R. (2020). Increasing organic food consumption: An

- p>integrating model of drivers and barriers.
- Journal of Cleaner Production*
- , 275, 123058. DOI: 10.1016/J.JCLEPRO.2020.123058.
- Jarzebowski, S., Bourlakis, M., & Bezat-Jarzebowska, A. (2020). Short food supply chains (SFSC) as local and sustainable systems. *Sustainability (Switzerland)*, 12(11). DOI: 10.3390/su12114715.
- Jehlička, P., Grīviņš, M., Visser, O., & Balázs, B. (2020). Thinking food like an East European: A critical reflection on the framing of food systems. *Journal of Rural Studies*, 76(March), 286–295. DOI: 10.1016/j.jrurstud.2020.04.015.
- Johansson, E., Hussain, A., Kuktaite, R., Andersson, S. C., & Olsson, M. E. (2014). Contribution of organically grown crops to human health. *International Journal of Environmental Research and Public Health*, 11(4), 3870–3893. DOI: 10.3390/ijerph110403870.
- Kiss, K., Ruskai, C., & Takács-György, K. (2019). Examination of short supply chains based on circular economy and sustainability aspects. *Resources*, 4, 1–21. DOI: 10.3390/resources8040161.
- Malak-Rawlikowska, A., Majewski, E., Was, A., Borgen, S. O., Csillag, P., Donati, M., Freeman, R., Hoàng, V., Lecoeur, J. L., Mancini, M. C., Nguyen, A., Saïdi, M., Tocco, B., Török, Á., Veneziani, M., Vittersø, G., & Wavresky, P. (2019). Measuring the economic, environmental, and social sustainability of short food supply chains. *Sustainability (Switzerland)*, 11(15). DOI: 10.3390/su11154004.
- Mass, M., Abebe, G. K., Hartt, C. M., & Yiridoe, E. K. (2022). Consumer Perceptions about the Value of Short Food Supply Chains during COVID-19: Atlantic Canada Perspective. *Sustainability (Switzerland)*, 14(13). <https://doi.org/10.3390/su14138216>.
- Michel-Villarreal, R., Hingley, M., Canavari, M., & Bregoli, I. (2019). Sustainability in Alternative Food Networks: A Systematic Literature Review. *Sustainability*, 11(859), 1–20. DOI: 10.3390/su11030859.
- Michel-Villarreal, R., Vilalta-Perdomo, E. L., & Hingley, M. (2020). Exploring producers' motivations and challenges within a farmers' market. *British Food Journal*, 122(7), 2089–2103. DOI: 10.1108/BFJ-09-2019-0731.
- Milford, A. B., Lien, G., & Reed, M. (2021). Different sales channels for different farmers: Local and mainstream marketing of organic fruits and vegetables in Norway. *Journal of Rural Studies*, 88, 279–288. DOI: 10.1016/J.JRURSTUD.2021.08.018.
- Miškolci, S. (2017). Consumer preferences expressed via shopping in alternative food chains. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 65(1), 311–318. DOI: 10.11118/actaun201765010311.
- Montiel-León, J. M., Duy, S. V., Munoz, G., Verner, M. A., Hendawi, M. Y., Moya, H., Amyot, M., & Sauvé, S. (2019). Occurrence of pesticides in fruits and vegetables from organic and conventional agriculture by QuEChERS extraction liquid chromatography tandem mass spectrometry. *Food Control*, 104(April), 74–82. DOI: 10.1016/j.foodcont.2019.04.027.
- Nemes, G., Reckinger, R., Lajos, V., & Zollet, S. (2023). 'Values-based Territorial Food Networks'—Benefits, challenges and controversies. *Sociologia Ruralis*, 63(1), 3–19. DOI: 10.1111/soru.12419.
- Paciarotti, C., & Torregiani, F. (2021). The logistics of the short food supply chain: A literature review. *Sustainable Production and Consumption*, 26, 428–442. DOI: 10.1016/j.spc.2020.10.002.
- Pauer, E., Wohner, B., Heinrich, V., & Tacker, M. (2019). Assessing the environmental sustainability of food packaging: An extended life cycle assessment including packaging-related food losses and waste and circularity assessment. *Sustainability (Switzerland)*, 11(3). DOI: 10.3390/su11030925.
- Poore, J., & Nemecek, T. (2019). *Reducing food's environmental impacts through producers and consumers*. DOI: 10.1126/science.aag0216 Article.
- Reina-Usuga, L., Parra-López, C., de Haro-Giménez, T., & Carmona-Torres, C. (2023). Sustainability assessment of Territorial Short Food Supply Chains versus Large-Scale Food Distribution: The case of Colombia and Spain. *Land Use Policy*, 126(April 2022). DOI: 10.1016/j.landusepol.2022.106529.
- Rivera-Ferre, M. G., López-i-Gelats, F., Ravera, F., Oteros-Rozas, E., di Masso, M., Binimelis, R., & El Bilali, H. (2021). The two-way relationship between food systems and the COVID19 pandemic: causes and consequences. *Agricultural Systems*, 191(March). DOI: 10.1016/j.agsy.2021.103134.
- Röös, E., Bajzelj, B., Weil, C., Andersson, E., Bossio, D., & Gordon, L. J. (2021). Moving beyond organic – A food system approach to assessing sustainable and resilient farming. *Global Food Security*, 28(January). DOI: 10.1016/j.gfs.2020.100487
- Schoolman, E. D. (2019). Do direct market farms use fewer agricultural chemicals? Evidence from the US census of agriculture. *Renewable*

- Agriculture and Food Systems*, 34(5), 415–429. DOI: 10.1017/S1742170517000758.
- Schoolman, E. D., Morton, L. W., Arbuckle, J. G., & Han, G. (2021). Marketing to the foodshed: Why do farmers participate in local food systems? *Journal of Rural Studies*, 84 (August 2020), 240–253. DOI: 10.1016/j.jrurstud.2020.08.055.
- Stubenrauch, J., Ekardt, F., Heyl, K., Garske, B., Schott, V. L., & Ober, S. (2021). How to legally overcome the distinction between organic and conventional farming – Governance approaches for sustainable farming on 100% of the land. *Sustainable Production and Consumption*, 28, 716–725. DOI: 10.1016/j.spc.2021.06.006.
- Tari Selcuk, K., Atan, R. M., Arslan, S., & Sahin, N. (2023). Is food insecurity related to sustainable and healthy eating behaviors? *Environmental Science and Pollution Research*, 30(29), 74280–74289. DOI: 10.1007/s11356-023-27694-8.
- Tuck, S. L., Winqvist, C., Mota, F., Ahnström, J., Turnbull, L. A., & Bengtsson, J. (2014). Land-use intensity and the effects of organic farming on biodiversity: A hierarchical meta-analysis. *Journal of Applied Ecology*, 51(3), 746–755. DOI: 10.1111/1365-2664.12219.
- Tudisca, S., Di Trapani, A. M., Sgroi, F., & Testa, R. (2015). Socio-economic assessment of direct sales in Sicilian farms. *Italian Journal of Food Science*, 27(1), 101–108. DOI: 10.14674/1120-1770/ijfs.v80.
- Ušča, M., Ieviņa, L., & Lakovskis, P. (2023). Spatial disparity and environmental issues of organic agriculture. *Agronomy Research*, 21. DOI: 10.15159/ar.23.077.
- Ušča, M., & Tisenkopfs, T. (2023). The resilience of short food supply chains during the COVID-pandemic : a case study of a direct purchasing network. *Frontiers in Sustainable Food Systems*, 7. DOI: 10.3389/fsufs.2023.1146446.
- Vittersø, G., Torjusen, H., Laitala, K., Tocco, B., Biasini, B., Csillag, P., de Labarre, M. D., Lecoeur, J. L., Maj, A., Majewski, E., Malak-Rawlikowska, A., Menozzi, D., Török, Á., & Wavresky, P. (2019). Short food supply chains and their contributions to sustainability: Participants' views and perceptions from 12 European cases. *Sustainability (Switzerland)*, 11(17). DOI: 10.3390/su11174800.
- Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T., Tilman, D., DeClerck, F., Wood, A., Jonell, M., Clark, M., Gordon, L. J., Fanzo, J., Hawkes, C., Zurayk, R., Rivera, J. A., De Vries, W., Majele Sibanda, L., ... Murray, C. J. L. (2019). Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, 393(10170), 447–492. DOI: 10.1016/S0140-6736(18)31788-4.

### Acknowledgement

This research has been supported by the European Regional Development Fund (project id. N. 1.1.1.2/16/I/001) under the activity “Post-doctoral Research Aid”, project No. 1.1.1.2/VIAA/4/20/682, “Organic Farming and New Food Values – Drivers to Sustainable and Resilient Food Systems”.