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Farmers' markets contribution to the resilience of the food systems

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Abstract

To mitigate the impacts of future shocks and achieve its targets, the Food Summit 2021 advocates for a transition toward more resilient Food systems. Alternative food movements, such as Farmers' Markets (FM), claim to contribute to this transition by offering a different approach to food consumption (Bilali in *Food energy secur* 8: e00154, 2019). FM are spaces where producers and consumers interact directly, trading locally grown and fresh products (Chiffolleau in *Agric* 6:1–18, 2016; Marsden in *Sociologia Ruralis* 40:424–438, 2000). The European Commission defines these short supply chains as "involving a limited number of economic operators, committed to cooperation, local economic development, and close geographical and social relations between producers, processors and consumers" (Regulation (EU) No 1305/2013 of the European Parliament and of the Council of 17 December 2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) and repealing Council Regulation (EC) No 1698/2005, 2013). The present study examines the mechanisms by which FM contribute to the resilience of Food systems. Qualitative data were collected from a FM worldwide, a case study involving nine members of the World Farmers' Market Coalition (WFMC). Results indicate FM resilience stems from their structure and unique position as niche markets. Also, their adaptive capacities and innovation are fostered by flexible governance structures and strong agency yet can be variable in degree depending on the context. As a source of innovation, FM can inspire policies and inform models for broader resilience in Food systems. Supportive policies and additional contextual research are crucial for creating an enabling environment for FM to thrive within the Food systems, and for scaling up successful emerging innovations to the whole Food systems.

Keywords: Farmers' markets, Food systems, Resilience, Short supply chain, Alternative food networks

Introduction

During the crisis that followed the COVID-19 pandemic, recessions, increased food price volatility, and losses in post-harvest exacerbated Food access constraints, leading to spikes in undernourishment (FAO, 2021). These challenges hinder progress toward Sustainable Development Goal 2 (SDG2) « Zero Hunger». Additionally, pests and diseases, climate change or extreme weather events, and other hazards further threaten Food systems.

To mitigate the impacts of future shocks and achieve its targets, the Food Summit calls for a transition toward resilient Food systems, advocating for a shift from vulnerability to strength. The summit emphasizes that “sustainable and resilient Food systems are fundamental for Food security and nutrition, contributing to healthy and balanced diets, poverty eradication, sustainable management of natural resources, conservation and protection of ecosystems and climate change mitigation and adaptation” (Food Summit 2021). Resilience is commonly defined as the ability to bounce back in response to a shock (Jones et al. 2022). Thus, understanding the mechanisms that enhance this resilience is essential for achieving a stronger and more resilient state.

Farmers’ Markets (FM) claim to contribute to the transition toward resilient Food systems by promoting short supply chains, and leveraging local and indigenous knowledge to adapt to contemporary challenges (El Bilali et al. 2019). FM have existed as local outlets for farms in many countries for a long time, and they re-emerged worldwide as part of alternative food movements since the 1970s, aiming to break away from productivity-driven, industrialized, and standardized food markets (Kjeldsen et al. 2013; Kondoh 2015; Lamine et al. 2019; Levkoe 2014). This paper focuses on these alternative FMs, which are built on the premise that they claim to offer more suitable and resilient structures than conventional channels for addressing contemporary challenges.

FM are commonly defined as “regular, recurring gatherings at a common facility or area where farmers directly sell a variety of fresh fruits and vegetables and other locally grown farm products to consumers” (Warsaw et al. 2021) or “public areas where fruits and vegetables producers gather to sell products directly to consumers” (Figuroa-Rodríguez et al. 2019). Integrating both statements, FM can be introduced as public spaces of direct contact between producers and consumers, where locally grown and fresh products are sold. As such, FM are physical entities where people meet at a specific location, with a social component characterized by direct consumer–producer interaction (Manser 2022; Smithers et al. 2008).

FM function as short supply chain with no intermediaries, involving a limited number of economic operators. This setup fosters direct, face-to-face interactions between producers and consumers (Chiffolleau et al. 2016; Marsden et al. 2000). These short supply chains are characterized by their limited length and by the geographical proximity between producers and customers. Producers and consumers are the core elements of FM, integral to their operation. However, internal differentiation in scope, aims, and governance mechanisms varies between FMs within one nation or across different countries (Vittersø et al. 2019).

Existing literature on short supply chains frequently examines FM focusing on their specificities as short value chains and how they compare to conventional channels (Figuroa-Rodríguez et al. 2019). Producers are often attracted by the opportunity to maximize the added value of their production and diversify their market channels. The limited number of intermediaries gives them greater flexibility and control over the supply chain (Kirwan 2004; Kjeldsen et al. 2013; Sonnino and Marsden 2006; Veidal and Flaten 2011). Consumers, on the other hand, have different motives. Some are drawn to FMs not only to meet their food needs but also to enjoy a leisure experience, something less common in other food distribution channels (Goodman 2016; Jaklin et al. 2015).

However, the most common reasons for participating in FMs are guarantees of quality and food safety, along with access to transparent information (Antwi and Matsui 2018; Carson et al. 2016; Kirwan 2004; Kjeldsen et al. 2013; Vittersø et al. 2019).

Common characteristics emerge, yet some specificities of FM related to ecological, economic, social, and health attractiveness are more nuanced, highlighting differences at FM level or national level. Purchasing from short supply chain are indeed not always more environmental-friendly or cheaper than other options (Bricas et al. 2021). In some cases, FMs have demonstrated positive effects on food education and health by promoting fresh food, and on local economies by create job opportunities. Yet they can sometimes create situations of elitism (Figueroa-Rodríguez et al. 2019; Goodman 2016; Sonnino and Marsden 2006; Warsaw et al. 2021). Last, beyond their primary mission of providing food, FM have this unique feature to create social bonds at community level. Through face-to-face interactions, producers and consumers build connections and trust, which can lead to a stronger sense of responsibility toward local community development and even in some places to a form of “civic engagement” (Jaklin et al. 2015).

During the COVID-19 pandemic, a growing body of literature highlighted various impacts on consumer and producer participation in short value chains and detailed the challenges of maintaining local food access despite shocks (Darnhofer 2014; Middendorf et al. 2022; Nemes et al. 2021; Zollet et al. 2021). However, there is limited understanding of how FM have learned from this experience or other shocks to develop resilience. Additionally, the resilience of local grassroots actions lacks empirical support (Stone and Rahimifard 2018), as does the contribution of such local short chains to the broader resilience of Food systems (Stone and Rahimifard 2018; Vittersø et al. 2019). Furthermore, the contextual influences on FM resilience are rarely acknowledged (Zurek et al. 2022).

With the goal of supporting the transition toward more resilient Food systems, this paper examines the role of FM in enhancing Food system resilience. Specifically, it investigates the mechanisms behind the resilience of FM and their contribution to the broader resilience of Food systems, with a focus on Food security.

Theoretical framework

Food systems encompass all activities related to food production, processing, distribution, and consumption, along with their socio-economic and environmental outcomes. They are considered socio-ecological system as they are closely interconnected with ecosystems, energy, and health, and are influenced by many external factors such as biophysical, technological, and socio-economic factors. The main outcome of Food systems is, rather than aiming for a state of equilibrium, to ensure Food security for all at all times (HLPE 2020).

The notion of resilience has increasingly been used to describe complex and dynamic socio-ecological systems in fields such as climate science, urbanization studies, and to talk about Food systems (FAO 2015). As with many emerging concepts, the literature offers a growing number of definitions for Food system resilience (Tendall et al. 2015).

Some definitions focus on how Food systems maintain a certain levels of Food security in the face of shocks and focus on measures of protection levels or stability (Béné et al. 2023). At the same time, the “resilience-as-a-capacity” literature emphasizes the agency

of actors as a key component of resilience analysis. It evaluates resilience by examining the potential of different assets and resources available to actors (Béné et al. 2023; Stone and Rahimifard 2018; Vroegindewey and Hodbod 2018). Building on this second perspective, we define Food system resilience as “the capacity over time of Food systems to ensure Food security for all in the face of unexpected shocks” (HLPE 2020; Tendall et al. 2015).

Numerous frameworks and models of Food system resilience have been developed for various research and planning purposes, ranging from practical applications (such as RIMA II) to more theoretical approaches. Reliable models for measuring Food system resilience have been established at the individual level, focusing on livelihoods or agricultural production systems (Béné et al. 2023; Darnhofer 2014; Meuwissen et al. 2021). Other examined interactions among Food system actors in supply chain management (Stone and Rahimifard 2018; Vroegindewey and Hodbod 2018).

Resilience frameworks are commonly employed to address the challenges of evaluating complex socio-ecological systems like Food systems (Tendall et al. 2015). “Resilience is not only about being resistant or robust to disturbance. It is also about the opportunities that disturbance opens up in terms of recombination of evolved structures and processes, renewal of the system, and emergence of new trajectories” (Folke et al. 2021). To characterize these different levels of response to a shock, authors have subdivided it into three commonly referred categories: the 1) resistive, 2) adaptive, and 3) transformative capacities (Allen and Prospero 2016; FAO 2015; Folke et al. 2021; Stone and Rahimifard 2018; Tendall et al. 2015). Resistance, often associated to robustness, is the ability to withstand shocks and remain. Adaptation is the ability to learn from experience and knowledge, to self-organize and adjust to moderate harm or exploit beneficial opportunities. It involves anticipation and prevention of future hazards through a combination of resources. Transformation refers to profound changes in dynamics or structures of domination and agency that address vulnerabilities to shocks.

Our approach examines the relationship between the resilience capacities of a Food system actor—FM—and the overall resilience of the Food system, as assessed by Food security. This resilience model, presented in Fig. 1, uses the vulnerability framework by Brunori et al. (2020), which effectively links shocks to Food security through the concept of vulnerability. This framework is particularly suitable for actor-oriented systems like FM, which, although dependent on ecological factors, are primarily driven by social processes and policies. The framework was adapted to focus on resilience rather than

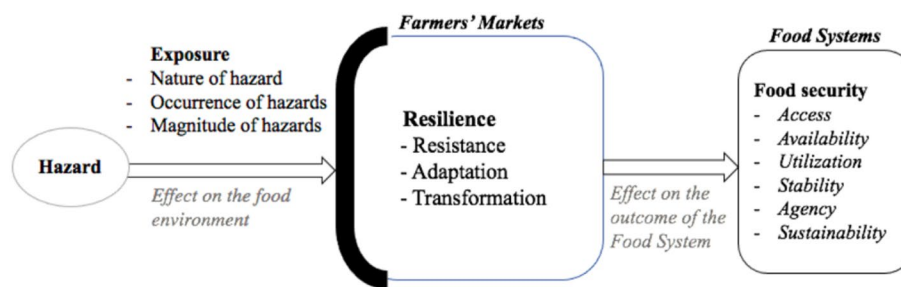


Fig. 1 A resilience framework for FM and the Food systems. Adapted from Brunori et al. (2020)

vulnerability. In this model, resilience is connected to shocks through vulnerability, but it emphasizes agency—the ability to develop and implement strategies to achieve a different state—over simply reflecting a lack of capacity resulting from sensitivity and exposure to shocks (Béné et al. 2023). This adaptation allows us to better capture the aspect of agency in the resilience of Food systems.

The frame permits to describe the exposure of the system, i.e., how likely it is to experience stress, providing a measure of the “need” for resilience. The exposure to a hazard is described by the nature, magnitude, and occurrence of the hazard, as well as its effects on the system (Brunori et al. 2020). Then, the three components of resilience—resistive capacities, adaptive capacities, and transformative capacities—are illustrated in the context of FM, along with their effects Food security. Food security is defined by six dimensions: Availability, Access, Utilization, Agency, Stability, and Sustainability. Availability refers to the challenge of producing enough and diverse food. Access pertains to the affordability of healthy food for everyone. Utilization involves the capacity of food to meet dietary needs. Agency denotes the ability of individuals or groups to make their own decisions over food strategies in consumption or production. Stability is the capacity to ensure Food security over time despite variations, such as sudden shocks or cyclical events. Sustainability refers a measure of performance of the long-term ecological, social, and environmental viability of Food systems to provide Food security now and for future generations (HLPE 2020).

Materials and methods

Data collection and analysis

Data were collected using an online questionnaire, as well as in-depth interviews and desk research—encompassing website analysis and a WPMC report. Semi-quantitative and qualitative data were analyzed using Excel. The questionnaire was designed based on the structure of the theoretical framework, as follows.

Understand the national FM context. The objective of this initial contextualization is to gather general information about the status and environment of FM organizations that are crucial for the functioning and recovery of its activities. Variables inspired by resilience assessment questions from Vroegindewey and Hodbod (2018) are:

- Density of FM (semi-quantitative)
- Average number of staff working at each FM (semi-quantitative)
- Average number of farmers in each FM (semi-quantitative)
- Motives (qualitative)
- Common management rules (qualitative)
- Partners and their roles (open-ended: qualitative)
- Specific characteristics of FM structures in each country (qualitative)

These variables are analyzed to assess variations in size, scope, management, and objectives among FM organizations (Table 1).

FM exposure assessment. The nature of hazards was predetermined according to categories commonly used by the IPCC: climate, pests, diseases, conflicts, and

Table 1 Presentation of the members of the WFMC that answered the questionnaire

Name	Country	Date of creation	Size of the organization	Number of FM in the organization	Number of farmers per FM	Scale of action the organization interviewed
Grønt marked	Denmark	2019	Individual FM	1	0 to 20	None (only manages one market)
Farmers market Norway	Norway	2003	Network of FM	15	Variable	Sources of finance for the network, Management rules for the network
Melbourne farmers markets	Australia	2002	Network of FM	12	20 to 50	Management rules for the network, Promotion for the network
The Farmers markets Ghana	Ghana	2015	Regional association	NA	20 to 50	No common guidelines
BC farmers market (BCAFM)	Canada	2015	Regional association	135	20 to 50	Management rules for the region, Governance and staff organization for the region
Fondazione Campagna Amica	Italy	2008	National association	1000	20 to 50	Management rules at national scale, Control bodies in charge at national scale
Farmers' markets NZ	New Zealand	2005	National association	25	20 to 50	Management rules at national scale, Governance & staff organization at national scale
Association for farmers, rights defense, AFRD	Georgia	1999	National association	25	More than 50	Sources of finance at national scale, Management rules at national scale, Governance & staff organization at national scale
Work for a better Bangladesh trust	Bangladesh	2020	National NGO	1	0 to 20	None (only manages one market)

socio-economic issues. For each respondent, if a hazard occurs in their country, they are asked to assess various variables:

- Intensity of the hazard (qualitative)
- Occurrence of the hazard (semi-quantitative)
- Time of recovery (semi-quantitative)
- Effects on FM (qualitative)

Table 2 The exposure of FM to hazard: nature, frequency, and nature of hazards affecting FM

Type of hazard	Frequency	Magnitude: how is the FM affected	Access	Availability	Affordability	Policy conditions	Food quality	Remarks
Climate-related hazard	Minimum every 4 years for all countries and regions	Physical access to the market is more difficult (roads are blocked, people cannot join the FM) (++)	Food production decreases (++) , workforce cannot join the workplace (+)	Prices increase and consumers purchase power decreases (+)	Climate, friendly food production rules are established (+)	Some productions are not adapted to the climate anymore (+)	Producers are impacted more directly than consumers	
Pest or disease on food produce	Great variability between countries or regions	Consumers have less access to food as a result of the lack of availability or affordability (+)	Food production decreases (++) , producers are the main impacted (+)	The price of food rise because of limited availability (+)	Regulations on food safety are reinforced (+)	Produce quality decreases (++)	Producers are impacted more directly than consumers	
Socio-economic	More than every 4 years for all countries and regions	People in the agricultural sector lose their job or are less paid, thus production is made more difficult because of less workforce (++)	Shortage in inputs prevent normal (+) productions, productions are destroyed by conflicts (+), workforce in farms decreases and so does the production (+)	The food produced is not always affordable for customers, which purchase power decreases (++)	Operating rules on FM change (+)		Both producers and consumers are impacted	
Conflicts	Great variability between countries and regions	Physical access to the selling place is prevented, because of destruction of infrastructure, or because of potential threats (+)	Reduction in international trade creates shortages in inputs for farmers (+), farms which hire migrant workers face a shortage in labor (+), change in consumers' behavior creates shortage in some products (+)	The prices of food products increase (++)			Depending on the conflict and the region, there is a wide variability of effects	
Example: COVID-19	Once	FM are temporarily closed (++) , when FM open, the layout and the access to FM are strictly regulated (distance, physical protections, etc.) (++)	Some people lose their jobs temporarily or permanently, there purchase power decreases (++)	FM can remain opened only if considered as essential services (++) , the operating rules on FM are strengthened, which increase the charges on workers (++)			Both producers and consumers are affected	

(++): This effect is shared by many WFM members (4 or more respondents)

(+): This effect occurs in a limited cases (less than 4 respondents mention it)

The questions are designed to ensure that the collected information generates relevant data for assessing emergent properties at the group level. The effects on FM were then categorized by the author using Food Environment dimensions (HLPE 2020) (Table 2): the availability (Production and sales opportunities), the access (Market accessibility for products), the affordability (Product pricing versus consumer purchasing power), the food quality (Reliability of products in terms of nutrition and safety), and the policy conditions (External rules affecting FM operations).

Resilience factors identification. Historical trajectories and trends were collected from the questionnaire as qualitative data. This information captures how FM organizations have historically reacted to shocks, their coping capacities, and their preparedness for future events.

Based on existing elements identified by Stone and Rahimifard (2018), the factors of resilience were categorized by the authors into: resistive capacities (Table 3), adaptive capacities (Table 4), transformative capacities (Sect. “Dimensions of FM resilience and their outcomes on Food security”). In-depth interviews provided specific examples of how FM organizations innovated during COVID-19 to enhance resilience.

Implications on Food security. In the analysis, each resilience factors were linked by the authors to one or Food security dimensions, as defined by its six dimensions: Availability, Access, Utilization, Agency, Stability, and Sustainability. Availability (HLPE 2020).

Sample

The paper contributes to the existing literature by offering a cross-country analysis of FM, examining FM roles on resilience across different nations. Qualitative data have been collected from questionnaire (Annex 1) with representants of nine national FM organizations, all of which are members of the World Farmers' Market Coalition. Follow-up interviews were conducted with three WFMC members selected based on their responses to the questionnaire, conditioned by their motivation to participate in the interview, and whether they developed innovative actions in response to COVID-19.

The ambition is not to achieve a statistically representative sample of FM or even a typology. Limiting the scope of the sample to members of the WFMC permits to get a broad view of the variety of FM settings and to get insight on the extent to which the context influences the resilience. At the same time, it ensures that these associations adhere to a shared understanding of the definition of a FM and consistent rules, thereby providing a stable parameter for our study.

Presentation of the WFMC

The WFMC was launched in July 2021, at the initiative of the Campagna Amica Network (Belletti et al. 2024) and the UN Deputy General Amina Mohammed. FM Associations from around the world were invited to participate and support the initiative. To this day, it gathers organizations from all the continents (Fig. 2).

In line with the vision of the High-Level Panel of Experts (HLPE) of the Committee on World Food Security in Rome regarding the resilience of the Food systems, the WFMC believes that FM can help reach the Zero Hunger ambition. They state that “if managed properly with clear and transparent rules and governance, FM can be an enabler of inter-connections between farmers and consumers and within communities” (Troccoli and

De Rosa 2021). They argue that bridges within and in between communities have the power to contribute to Zero Hunger, as well as to civic, commercial, and climatic health.

Although there are no globally established rules among the WFMC's members, they share a set of core values and requirements:

- **Direct Marketing Commitment:** Resellers are few in FMs; sellers are either farmers or producers who process local raw foods on a small scale. In some cases, the number of resellers is restricted or even forbidden. BCAFM Canada refers to it as “100% Grow, Make, Bake Vendors.” Consumers are assured that farmers receive all the benefits of the prices paid for their products.
- **Transparency of Food Origin and Competition:** FMs ensure transparency regarding the origin of food. The WFMC guarantees that only fresh, high-quality, and local products are available at their markets. The availability of products is conditioned by local production.
- **Inclusivity and Affordability:** FMs are open to participation on both farmers and shoppers' sides. Despite the emphasis on quality, products must maintain fair competition by remaining affordable for consumers and viable for farmers.
- **Regular Occurrence:** FMs take place on a recurring basis.

Results

Common objectives of FM organizations

Generally, the respondents highlight that FM have common objectives. Especially, they want to differentiate themselves from other retail channels in several aspects. All respondents assured that motives for producers to participate in FM were to make more profit. Food quality in FM is deemed higher either because it is organic or fresh, which attract consumers. In Georgia, the claimed objective of FM is to provide “more fresh and nutritious food for all” and Denmark on the “seasonality of products.” Bangladesh FM and Ghana FM accentuate the importance on food safety as a priority of FM in their countries compared to other respondents. On consumers side, neither low prices nor the difficulty to access other food channels was considered a motive to buy in FM. Prices are often higher than for other outlets (linked to higher quality) and food is easily accessible in other outlets.

The social aspect of shopping on FM was seen a shared asset and a positive characteristic. It is seen as “a meeting place for farmers and customers” for FM Norway and contributes to “creating more lively and attractive public spaces” for WBB Bangladesh, “bringing together farmers and citizens” for Campagna Amica Italy. A specificity mentioned by Grønt Marked Denmark is that it can connect urban with rural people.

In their actions and structuration, FM show differences, especially in scale of influence and connectivity. Table 1 shows that national or regional FM organizations can influence the connectivity of FMs by creating management rules, establishing oversight bodies, providing sources of finance, setting governance structures, organizing staff, and offering training. The level of connectivity varies significantly: Some FMs are highly integrated, while others are more isolated. For example, the WFMC aims to connect most

Table 3 The factors of resistive capacities of FM and their outcome on Food security

Factor of resilience	Is the factor shared among all FM?	Mechanism: how is FM resistant	The case of FM in the WFM	Potential outcome on the resilience of Food security in case of shock
Redundancy of products on FM, the ability to call upon alternate production	No. FM do not have all the same size	On FM, many farmers sell the same products. If one vendor is not able to sell on the market because of a shock, the others can ensure the functioning of the market, at least to a certain extent. The more the number of farmers selling the same products, the higher is the redundancy	The number of farmers depending on the FM is variable. It goes from 10 (in Denmark and Bangladesh) to more than 50 (in Georgia and Ghana). The density of FM varies depending on the country or regions: from more than one per city to one per region. <i>"People in Norway live far from each other. Because of the long distances, the FM are fewer, and it makes it harder to make ok income on a local market"</i>	Stability: There is no interruption of food production and distribution. Availability: Products are available in enough quantity because many farmers sell it. Access: Consumers can access products from different outlets
Self-organization of farmers, flexibility, and agility, the ability and will of a system to internally organize itself in a minimum time or effort	Yes. This is linked to the fact that FM are a short value chain. The shorter, the more flexible	FM are short supply chains, in which farmers are not only food producers and are more involved in the whole organization from farm to fork. In the absence of intermediaries, as farmers ensure different roles of longer supply chains (storage, transport, selling, and production), they can adjust the processes at each step. In case of, it decreases the need for coordination, and they can adjust themselves at each stage. The absence of intermediaries makes it quicker for farmers to react. The transaction costs are lower (communication, finance, infrastructure, etc.). The solutions found are more likely to be realistic and adapted to the needs	<i>"There is less reliance on transport and warehousing," "What make the FM resilient? Farmers and their adaptability," "We believe the very existence of FM increases resilience since they shorten the supply chain and improve the situation for farmers," and "farmers are oriented towards practical solutions"</i>	Agency: Farmers are empowered and gain in autonomy; the Food system is not completely at the whim of external forces. Stability: There is no interruption of food production and distribution. Sustainability: There is less loss in the mobilization of resources

Table 3 (continued)

Factor of resilience	Is the factor shared among all FM?	Mechanism: how is FM resistant	The case of FM in the WFMC	Potential outcome on the resilience of Food security in case of shock
<p>Visibility, transparency of the production, the ability to see structures, processes, and products from one end of the supply chain to the other</p>	<p>Yes, as mentioned in WFMC rules. Also, direct consumer–producer relation makes it possible for consumers to have direct access to information on produces</p>	<p>The fact that FM are short supply chain give the possibility to consumers to have a clear view on price, selling methods and producers' work. Direct relationship producer–consumer also allows direct questions and answers and circulation of the information. In case of shock, if consumers are convinced of the model of FM and can discuss with farmers, they would continue to support it even though it is harder</p>	<p>The information on FM and their producers is easily available: All FM have a website or a Facebook page to share information with consumers; producers and consumers meet regularly on FM; Facebook groups or WhatsApp groups give the possibility of chatting. Information and communication are priorities of FM: "Consistency of message and communication to the public is a priority," "The market must be run in such a way that relations between growers and final consumers are open, honest and display integrity of purpose of the market"</p>	<p>Utilization: The consumption of local and fresh food is improved because consumers are aware of what they eat. Agency: Consumers can make purchase decisions based on clear understanding of how the food is produced. Sustainability: Consumers' awareness on food production and agriculture challenges increases</p>
<p>Direct relationship consumer—producer, the way in which producers and consumers interact on FM</p>	<p>Yes. This is the nature of FM as a short value chain. It is one of the principles of the WFMC</p>	<p>FM is a space for direct encounter between consumers and producers. Direct communication is key for exchange of information and to build trust. Trust can emerge from close relationships, if consumers and producers commit to showing up to FM on a regular basis, and if the reliability of the exchanges (both material and communicative) is guaranteed. In case of hazard, direct communication and close relationships can be a vector of reactivity and responsiveness. People are more likely to finding solutions through sharing and to build cooperation with Trust (Ostrom 1996)</p>	<p>FM's objective is "to be meeting place for consumers and producers." "Dedication and regularity are key for FM," "What make FM resilient: The People—Market Organizers, Vendors and Dedicated Customers," and "FM can contribute to build a social network and communal practices"</p>	<p>Agency: Stronger relation between the actors of the Food system can reinforce trust between actors. This gives the possibility that problems can be discussed openly and solutions to be found easily. Stability: Unexpected behaviors of either farmers or consumers are less likely to occur: The consumption and production patterns remain stable. Utilization: Consumers become aware of what they eat and change their eating habits</p>

Table 3 (continued)

Factor of resilience	Is the factor shared among all FM?	Mechanism: how is FM resistant	The case of FM in the WFM	Potential outcome on the resilience of Food security in case of shock
Responsibility of consumers toward farmers, the sense of duty that pushes people to act in a certain way	Yes. Prices are higher in FM than in other outlets, but consumers participate. Its degree greatly varies between FM or regions	Consumers may have the will to pay a higher price and to participate in FM if they consider that the cause is worth the effort. Some consumers think that consuming local can create a virtual circle (economic and social) at the community level. In case of shocks, some consumers would continue to support FM, even if it is difficult, because they feel responsible for the community	"Consumers have the desire to support local businesses" and "to contribute to keep the community alive." "What makes the FM resilient?—Consumers' will to improve farmer situation"	Stability: Consumers keep the same purchasing habits, the Food system is not disrupted much by shocks. Agency: Farmer's power is increased by consumers' recognition of their work. Sustainability: Shared values can emerge from participation in FM
Market position, the capacity to differentiate its business model	Yes. FM emerged as an alternative food movement in opposition to the conventional Food models	FM values make it different from other food outlets and contributes to its resistive capacities over time. If people are convinced by the model of FM, they would continue to buy (for consumers) or sell (for farmers) there, even if it becomes more difficult, or if there is no economic benefit in doing so. Also, FM settings differ from other settings as it is mostly outside in public spaces. FM settings differ from other settings as it is mostly outside in public spaces. In the face of shock, it gives more flexibility as the infrastructures are mobile, but security of people must be ensured	The Grønt Marked being the first FM in Copenhagen, it represents a new market position at the scale of the city. FM have strong values: it is "a space where people connect with the food they eat"; it promotes "more fresh and nutritious food for customers," "works for diversity," and "connects the urban areas with the rural areas." "In the case of COVID-19, people felt safer to shop in FM because of the outdoor setting." In the case of COVID-19, FM reacted with more control on food safety, creating new set up for markets	Availability: FM encourage farmers to produce organic produce. Access: Consumers can have access to fresh and local food. Utilization: FM communicate and promote the consumption of fresh, nutritious, and local food. Sustainability: FM promote strong local and organic produce in the Food system

Table 4 The adaptive capacities of FM and their outcome on Food security

Factors of resilience	Is the factor shared among all FM?	Mechanism: how is FM adaptive	Example in the WFM	Potential outcome on the resilience of Food security in case of shock
Risk-aware culture, the structures (physical or social) in place in FM to manage risk	No. FM-dependent	In case of hazard, FM can build on the existing awareness of people on hazard to react. The risk-aware culture can be reinforced with trainings. Constituting assemblies or member boards of people dedicated to think and raise awareness on risks can also reinforce this aspect	The BCAF Canada is member of the Farmers for climate solution, a coalition of farming organizations (more than 20,000) in Canada, which farmer-led task force experts, advise on actions for reduced climate emissions. By diminishing the emissions, the ultimate goal is to limit global warming (or local climate disruptions) and to adapt to or prepare for climate change. These examples show that FM in this region in Canada are aware of potential changes and trying to prepare or adapt to it, in order to limit the potential negative effects on their organization. For this purpose, they mobilize human resource and its ability to learn and share knowledge. Among the members of the WFM, some offer trainings on marketing, promotional campaigns, product safety, management, and others focus on advocacy or also on research and development initiatives. Such trainings can be delivered directly at the FM level. In the case of Ghana, "the best way to anticipate for future hazard for FM is to provide training on Good Agricultural Practices. Indeed, ensuring the Stability of the supply provision is key, both to keep up with existing outlets and also to scale-up."	Agency: The abilities of people to react to hazard are enhanced. Sustainability: Skills learned can serve in many contexts in the future and can be spread to others. Stability: Farmer produce food in a way that is adapted to environmental changes, without risk of diminishing production in the future

Table 4 (continued)

Factors of resilience	Is the factor shared among all FM?	Mechanism: how is FM adaptive	Example in the WFM	Potential outcome on the resilience of Food security in case of shock
Contingency plans, pre-established crisis management teams and procedural guides for potential disruptions	No. FM-dependent	In the anticipation of a recurring risk (a fire, a drought), a plan can be established in advance on how to react, which resources to mobilize. This allows for quicker response and may be also more efficient in resources. This also requires taking all precautionary measures to ensure that the protocols are adhered to	BCAFM Canada established an Emergency Preparedness Committee in. This is a group of experts, which documents case studies and tools and best practices of different experiences worldwide. Building on this knowledge they can prepare plans for the specific case of the FM engaged in their organization. It is different from the risk-aware culture as it designs more precisely guidelines to follow in the case of a hazard. It is not only building knowledge on potential risks, but actually also adapting them and implement them in an emergency context. During the COVID-19 pandemic, the guidelines and resources and updates on decisions could be find on the organization's website by every member. Establishing insurance: as a FM Member of the BCAFM Canada, some FM might be eligible to insurance against an annual fee. In this case, the insurance can cover commercial general liability (bodily injuries and property damage), and also for errors in the management of the Association (liability insurance). One can imagine that climate insurance could be an interesting product for FM in the future, in order to be more resilient and prepare for shocks. As FM offer a range of services (marketing, trainings, etc.), and given the relation of trust and knowledge of participants that is characteristic of FM, there is a potential to develop insurance in FM. Yet, resources and financial support are necessary to design such a financial service	Stability: There is a quick adaptation in the use of community resources in the face of shocks, and there is no disruption. Agency: The mobilization of resources (human and material) is easily adaptable in the community. Availability: Farmers have less risk or uncertainty in production returns, they can produce more food with less fear

Table 4 (continued)

Factors of resilience	Is the factor shared among all FM?	Mechanism: how is FM adaptive	Example in the WFMC	Potential outcome on the resilience of Food security in case of shock
Community resources; the set of ecological, economic, social, physical, institutional, and cultural resources a community can draw upon when faced with disruption	No. Context-dependent	The resource available, if well linked to FM can be mobilized in an efficient and effective manner when a shock occurs. This implies establishing partnership in advance to anticipate the need for these resources	One example is human resources for FM: "volunteers help with the markets days." "Local shops who can help with some logistic aspects such as toilet access, electricity, food the volunteers and producers, leftovers management;" and "the staff worked harder during the COVID-19." This cooperation with the different stakeholders at the community level can help manage resources for resilience of the Food system. Local government and municipalities can also support resilience with institutional or financial resources. For example, during the COVID-19 pandemic, their role in establishing FM as an "essential service" was crucial in order to continue functioning, to get financial or material resources	Stability: There is a quick adaptation in the use of community resources in the face of shocks, and there is no disruption. Agency: The mobilization of resources (human and material) is easily adaptable in the community. Utilization: Customers are aware of the human importance of FM on communities and vice versa
Innovation, the emergence of new features of change—either technical or social—in a given environment	No. Context-dependent	Novel ideas have the potential to transform the operation of FM. The strong mutual support between consumers and producers within FM creates a significant base of potential supporters capable of devising and implementing solutions. Innovation thrives in FM due to shared beliefs and effective communication. Farmers' independence from intermediaries facilitates exchanges of ideas and the emergence of practical solutions. It encourages learning, joint decision-making, and creativity	Online FM is an example of an innovation that flourished during the COVID-19 pandemic among WFMC members. In Italy, a platform allows consumers to book products online and either to receive them at home or collect them at the market. In Ghana, communication channels via WhatsApp and Facebook have been more utilized than ever since the pandemic began. Farmers inform consumers on social media about the product availability at a given time. They can then deliver products directly to consumers based on interest, or consumers can pick them up directly at the farm. This coordination between product availability and consumption helps avoid losses and makes access to fresh products more convenient	Availability and Access: Delivery of produce is maintained even when physical interaction is limited. Stability: facilitate everyday FM operating work, by diversifying the trading modes. Utilization: Customers' shopping experience differs online



Fig. 2 Geographical distribution of the members of the WFMC

FMs worldwide that adhere to its rules and share the same vision. In some cases, it connects through umbrella organizations, at national or regional levels (e.g., Italy, New Zealand, Georgia, and Canada). Some members of the WFMC are single FM (e.g., Norway and Bangladesh), meaning that in their country, there is less connectivity among FM actors at the regional or national level.

Contextual specificities

Differences in the structures of FM emerge based on their context within different countries. This pattern is influenced by the traditions of FM in each country.

For instance Italy, the importance of Alternative Food Networks has deep roots. A notable example is the Slow Food Movement, which emerged in 1983. This movement criticizes industrialization, food delocalization, hygiene regulations, and large retailers for promoting standardized diets and marginalizing traditional foods. It emphasizes quality linked to traditions, reflecting how local traditions and natural resources once led to a diverse array of foods. This commitment to high-quality raw products and a strong connection to the local territory likely explains the prevalence of Campagna Amica, a major organization with over 1000 FMs throughout Italy.

In British Columbia, since 1980, there has been significant activity aimed at creating social, political, and economic changes within the food system, particularly through the establishment of the British Columbia Food Systems Network. In the mid-1990s, various Alternative Food Networks (AFNs) and individuals began to spread across the province. A distinguishing feature of these initiatives in British Columbia is their strong focus on involving Indigenous communities as a core aspect of the organization (Levkoe 2014).

In contrast, Denmark has a shorter history with FMs. Since 2019, Grønt Marked has been connecting local small-scale producers with consumers in Copenhagen, being the first and only local FM in the city at that time. Denmark's food system, established in the late nineteenth century, was built on liberal values and a quest for efficiency, resulting in a highly capital-intensive and technologically advanced agricultural sector (Kjeldsen

et al. 2013). AFNs in Denmark emerged in the 1980s as reactionary movements, primarily driven by the organic movement and the spread of Community Supported Agriculture.

Local policies too, vary and can encourage the establishment or not of FM. For example, municipalities often have to provide a space to FM or to give them the authorization to occur (“they give us the square or buildings where we can do the FM”). In Italy, the “legge di orientamento” (also known as Italian law on multifunctionality) enacted in 2001 redefined the concept of farmers in the civil code. As such, it redesigned their role in the management of the company. The activities including manipulation, conservation, transformation, marketing, and promotion were considered by the law. From then on farmers have had the opportunity to diversify their activities while remaining anchored in the agricultural sector. This gives them the possibility of taking part in FM, without the need of resellers.

Acknowledging these common traits and differences among FM associations is crucial to comprehensively listing the characteristics that confer resilience to FM. It also highlights how the context influences local Food environments.

Effects of hazards on FM

The exposure of FM to hazards depends on the type of hazard, its frequency, and the magnitude of its effects on the FM structures. Generally, climate events and pest infestations directly affect production by causing destruction or damage during growth, harvest, or storage. Socio-economic hazards impact the livelihoods of both consumers and producers, affecting their ability to participate economically in FM. Conflicts can either directly damage production or indirectly disrupt the Food system by changing regulations or limiting consumer purchasing power. For example, the COVID-19 pandemic impacted the health system, illustrating how interconnected systems (economic, health, etc.) can indirectly affect the Food system. The effects of one system can transfer to another, necessitating a systemic approach to studying FM resilience that considers various stakeholders and external conditions.

The results in Table 2 show that acceptability and information guidelines are not directly impacted by hazards compared to access, availability, stability, and, to a lesser extent, utilization and policy conditions. The following of the studies reveals whether resilience relies on the acceptability and values conveyed by FM or on reinforcing its weaker aspects: availability, affordability, and acceptability.

Hazards can cause a wide range of unpredictable negative impacts on FM. To be effective, the spectrum of solutions should be as broad (or broader) than the range of effects. There is significant variability in responses from different regions regarding the types of hazards, their frequency, and their impact. The frequency of climate events or pest infestations varies by region, geographical context, and season. The frequency of socio-economic downturns and conflicts depends on a country’s political or social context at a given time. Climate-related hazards generally occur more frequently (at least every 1–4 years) and relatively uniformly across countries.

If FM anticipate solutions that are too specific, they may not effectively respond to an actual hazard. However, broadening the spectrum of solutions involves a

trade-off. A larger range of potential coping mechanisms might require more resources, or each potential solution might be less effective individually. An alternative is to build the capacity to find solutions quickly and effectively in the face of shocks, namely, adaptive capacities.

Dimensions of FM resilience and their outcomes on food security

Resistance

The resistive capacities correspond to the ability to cope with and withstand to a shock. This relies on the assets of FM, namely, its intrinsic strengths.

Table 3 shows the factors of resistive capacities of FM and their outcome on Food security.

Adaptation

Table 4 discusses the capacities for learning, preparedness, and anticipation of FM to adverse events. Contrary to the resistive capacities of FM, adaptive capacities are more variable from one FM to another one or from organizations to organization, as an intermediate quality of resilience. A key aspect of adaptive capacity of human societies is learning; that is, capacity of the system to change as a consequence of past experiences. It mostly relies on the people and the governance.

Transformation: FM as innovator in food systems

Beyond resistance and adaptation, the ultimate dimension of resilience involves developing transformative capacities. Transformation entails reshaping the state and rules of a system (Folke et al. 2021). Social innovations, which are innovations that introduce new social organizations to meet societal needs, can play a pivotal role in driving transformation (Ingram 2015; Klerkx and Leeuwis 2009; Loorbach 2010).

FM unique social structures introduce novel ways of organizing and exchanging food, driven by the mobilization and self-organization of activists, farmers, and consumers seeking alternative business and consumption practices. For instance, since 2015, Farmers' Market Associations in Ghana have pioneered a new FM model diverging from traditional approaches in the country. Traditional markets in Ghana are dominated by retailers who act as intermediaries, buying from farmers and selling in bulk. In contrast, the new FM model establishes markets owned by farmers, enhancing their decision-making power and facilitating direct farmer-consumer links. This innovation has expanded to five regions in Ghana, although scaling up to new regions presents challenges such as spreading the novel approach and garnering support from more farmers and consumers, requiring time, communication, and resources. Despite its potential, this form of FM remains niche in the country, highlighting the need for dedicated capacity-building efforts to scale up social innovations, especially in competitive retail environments where entrepreneurial and marketing skills are crucial.

Also, FMs address social challenges by fostering connections, creating economic opportunities, promoting food knowledge, encouraging healthy eating habits, and providing venues for community events (Chiffolleau et al. 2016). A case in point is

Copenhagen's Grønt Marked, which aims to connect rural producers with urban consumers by providing access to fresh, local products and urban settings for producers. This initiative represents a transformative approach to organizing food flows and exchanges, fostering links of the city with its rural surroundings (Chiffolleau et al. 2016).

FM contribution to food system resilience and transformation

FM are integral parts of the Food system, meaning that factors contributing to FM resilience also bolster the resilience of Food systems as a whole. By diversifying the types of food channels available, FMs enhance the overall resilience of Food systems. If one market channel faces disruption, farmers can pivot to others to sell their produce, ensuring continued food availability for consumers. Several authors contend that both short and long supply chains complement each other, essential for fortifying Food system resilience (Brunori et al. 2016; Chiffolleau et al. 2016). Therefore, policy support should encourage this diversity and foster interactions among various Food system actors.

Ensured Food security for all is the main outcome of functioning Food systems (HLPE 2020). FM resilience contributes to Food security in different ways that were detailed in previous results (Table 2, Table 3). It shows that FM contribute to all the aspects of Food security: Access, Availability, Utilization, Agency, Stability, and Sustainability.

Lastly, by challenging traditional discourses, AFN like FMs have the potential to disrupt conventional Food structures, catalyzing transformation within Food systems. Operating as small laboratories for innovation, successful FMs serve as experimental models, influencing others to embrace change and catalyzing shifts in policymaking. Their smaller scale and position on the margins of mainstream Food channels, coupled with the independence of both producers and consumers, empower them to establish new norms divergent from dominant paradigms. Through robust social interactions and shared values, these social movements not only reshape Food systems but also foster broader social relations within communities.

Discussion

Methodology

This study uses a resilience framework to assess the resilience of the Food systems. Such frameworks are commonly employed to address the challenges of evaluating complex socio-ecological systems like Food systems (Tendall et al. 2015).

Many studies on resilience fail to capture the complexity of relationships between multiple variables. For instance, they often overlook the dependence of FM on other components of the value chain, such as farmers' production capacity, physical infrastructure, and supportive local policies. Without the ability to produce, for example, farmers cannot participate in the market. Conversely, a key factor contributing to Food system resilience is the diversity of its value chains (Stone and Rahimifard 2018), which allows the system to sustain itself even in the absence of FM.

Using value chains as an entry point is promising because it includes all the steps and actors involved in the production, manufacturing, and distribution of food, up to its final consumption. Also, assessing Food system outcomes helps to reveal this complexity. For

example, availability is linked to production capacity, while accessibility depends on the physical infrastructure that enables FM to take place. However, as Zurek et al. (2022) notes, improved assessment methods are needed to better measure these interactions, particularly how different systems' resilience levels affect overall Food system resilience. The role of governance in these interactions should also be strengthened within the model itself.

Contextual and structural resilience of FM

While the literature increasingly recognizes the elements that contribute to resilience, the role of context is less explored and not well understood (Darnhofer 2014; Zurek et al. 2022). This study's originality lies in its cross-country assessment of FM resilience, aiming to provide insights into factors that contribute to it. These factors may be intrinsic to the structure of FMs, influenced by local contextual conditions, or driven by the self-motivation of individual FM actors. Frameworks like Béné et al. (2023) suggest incorporating the local food system context into resilience assessments, which could guide future research.

The results indicate that some resilience factors are inherent to FMs as short value chains. Direct consumer–producer connections enhance flexibility and transparency, and FMs benefit from a strong market position with consistent consumer participation despite higher prices, due to the values these markets represent. Conversely, context-dependent resilience factors include product redundancy, risk awareness, contingency planning, community resources, consumer responsibility, and innovation. The variability in resilience across structures is not well-documented (Vittersø et al. 2019).

The theory of convention partially explains variations in consumer responsibility toward farmers by categorizing relationships into “market coordination” for relationships that are principally over produce quality, as “domestic coordination” for the ones motivated also by face-to-face interaction, and “civic coordination” when participation in FM is encouraged by the adherence of both actors to a core set of collective principles (Marescotti 2000). Civic coordination, driven by shared principles, tends to have a greater impact on community development and FM resilience compared to those focused solely on food quality.

Innovation within FMs is influenced by social capital and the level of responsibility between producers and consumers. Strong connections and shared civic engagement increase the likelihood of developing common social practices that address community needs, such as improving well-being and living conditions (Edwards-Schachter et al. 2012). However, local chains are not necessarily spaces of trust and mutual respect (Chiffoleau et al. 2016). Understanding factors that influence the creation of strong social capital in different contexts is crucial for developing supportive environments for FM.

Policies can play a crucial role in fostering FM resilience by encouraging some factors of resilience. This study finds that FM organizations often depend on governments regarding fundings, enhancing market attractiveness through regulations and standards, protection of farmers' interests, and, in some cases, promotion innovation and scaling up. In this regard, some argue that more comprehensive resilience strategies that

support the entire food supply chain, rather than focusing solely on the resilience factors of individual organizations (Stone and Rahimifard 2018). Chiffolleau (2016) question the way in which agri-food territorialization, in addition to reinforcing a certain reconnection between agriculture and food, engage together and with external territories.

Local policies play a key role in fostering the resilience of food systems by providing funding, enhancing market attractiveness through regulations and standards, protecting farmers' interests, and promoting innovation and scaling up. This aligns with the idea that resilience strategies that support the connections across all levels of supply chains, not just food markets as individual entities, are needed (Stone and Rahimifard 2018). Some attempt to do so by emphasizing the importance of actor systems in Food systems. They include in territorial agri-food system thinking not only local actors in production, processing, and distribution but also technical advisors, territorial or localized public policies, consumers, and civil society (Chiffolleau et al. 2016; Lamine et al. 2019).

Conclusion

The study underscores the pivotal role of FM in supporting Food system resilience, particularly in the face of challenges such as the COVID-19 pandemic. By examining the case of the WFMC, the study demonstrates how FMs contribute to overall Food system resilience. FMs are valuable assets in achieving resilient Food systems, functioning both as integral components of the food environment and as sources of innovation for mainstream channels.

Common resilience factors among FMs stem from their fundamental structure as short supply chains and highlights the importance of direct producer–consumer interactions. Their role as niche players, coupled with their unique governance structures, also facilitates innovation within Food systems. Rather than merely disrupting existing systems, FMs act as catalysts for transformative change. However, their niche status also limits their broader impact and outreach.

Another key finding is that because resilience factors are highly contextual, scaling up resilience requires integrating research and actions with broader contextual considerations. For a successful and sustainable transition to resilient Food systems, it is essential to leverage synergies and complementarities among all stakeholders within value chains and the broader environment of FM.

Limitations of the work

Limitations of this study include data constraints due to the time limitations and geographical spread of the organization, which precluded conducting group discussions with members of the WFMC to confront opinions. Additionally, given the time of the data collection quite close to the COVID-19 pandemic, this study could not analyze the long-term resilience of FM reactions. Future studies examining these criteria over time would provide valuable insights into the adaptive capacities and the effectiveness of innovations.

FM operate within complex multi-scale, multi-stakeholder systems, interacting with various components of Food systems and external actors. While the perspectives of FM organizers within the WFMC provide valuable insights into internal challenges and opportunities, they do not fully explore local synergies or dynamics with other local stakeholders. Adopting a more local approach could serve to align food policies with spatial planning, education, research, health, and social care.

This study draws on experiences from diverse countries and highlights the potential of FM within varying national contexts. Given the Coalition's recent establishment in 2021, participation in knowledge-building activities may be uneven among members. As the organization expands and enhances exchanges, future research is encouraged that encompass the diversity of contexts and experiences of short supply chains.

Abbreviations

AFN	Alternative Food Networks
FM	Farmers' Markets
HLPE	High-Level Panel of Experts
SDG2	Sustainable Development Goal 2
WFMC	World Farmers' Market Coalition

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Author contributions

AL designed the work, collected the data, and drafted the paper. RM supervised the writing phase and revised the work. GG drafted the paper and wrote the final version. All authors read and approved the final manuscript.

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Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Competing interests

The authors declare that they have no competing interests.

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