

Alternative food networks and opportunities for transformation towards a sustainable and resilient urban food system

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Abstract: Food systems are suffering from pressures related to population growth, increased urbanisation, climate change, and resource scarcity. These pressures are exacerbated by globalisation, with consumers concentrated in urban areas while producers are dispersed across rural areas that are often remote or even in different countries. To address these challenges and create a more sustainable and resilient future, many local governments have embraced the idea of urban food systems. The literature identifies a range of sustainable and resilient outcomes for urban food systems but finding effective transition pathways remains a challenge. Alternative food networks have emerged with the goal of being more environmentally sustainable and socially just. A systematic literature review was conducted to identify how alternative food networks can contribute to achieving sustainable and resilient urban food systems. The analysis of 50 international case studies showed that alternative food networks may be able to create a food provision system that contributes to: the generation, transfer, and appropriate use of food knowledge and skills; the protection of surrounding ecosystems; more participative decision processes; improved local food supply; and, increased connectivity between urban and rural areas. Social justice and product diversity, however, are issues that remain a challenge. The paper concludes with insights for supporting Australian alternative food networks, including: the further evaluation of alternative food networks capacity of reducing greenhouse gas emissions and food loss and waste; the inclusion of alternative food networks as a possible climate change adaptation strategy for urban food supply; and an analysis of how governance arrangements can better support these initiatives.

Keywords: *Local food supply. Climate change. Urban food policies. Adaptation. Urban food strategies.*

1 Introduction

The availability and equitable access to high quality food remains a challenge for food systems and this situation is likely to worsen in coming decades (IPES-Food, 2017). The degradation of fertile land, the depletion of aquifers, the loss of forests and biodiversity, and the decrease of fossil fuel reserves will impose limits on food systems that rely on access to limitless natural resources (Carey, 2013; Morgan and Sonnino, 2010). In addition, climate change will impact on the quantity, quality and safety of food at all stages of the system: from production to processing, transport, storage, consumption and waste disposal (Vermeulen et al., 2012). Food systems also need to reduce food loss and waste (HLPE, 2014). Further, a growing and increasingly urbanised population will create a pattern of geographically concentrated demand for food (UN, 2014). Globalised food systems disconnect producers from consumers, hiding environmental impacts and social injustices (Cretella, 2016; Hinrichs, 2016).

Local food policies can play an important role in addressing these issues and can go beyond technological solutions (Ericksen et al., 2009; Mataracena, 2016; Thompson and Scoones, 2009). At the local level there is growing interest in using an urban food systems (UFS) approach to create new structures that encompass all activities and actors, as well as their social, economic and environmental contexts (Dubbeling et al., 2016; Meerow et al., 2016; Sonnino, 2016; Zeunert and Waterman 2018). This complex and challenging situation demands food policies that are conducive to supporting more sustainable and resilient UFS (Milan Expo, 2015) where food sources are more diversified, the distance for food transport is reduced, and decision making is defrayed to a range of actors. These have the potential to generate an economy that serves social needs while operating within planetary boundaries; as well as coping with stress, adapt and transform in response to changing climates (Folke, 2016; Giddings et al., 2002; Vieira et al., 2018).

Alternative Food Networks (AFNs) have emerged recently as a bottom-up social phenomenon that seeks to operate outside the industrial globalised supply chains (Barbera and Dagnes, 2016; Berti and Mulligan, 2016; Forssell and Lankoski, 2016). In addition, AFNs espouse values of social justice, environmental sustainability, community health, and democracy (Levkoe, 2011; Maticena, 2016). The most common types of AFNs are farmers' markets, community supported agriculture (CSA), buyers' group, food hubs, box schemes, community gardens, and agroecology networks.

Previous studies of AFNs focused on specific types or locations (Barbera and Dagnes, 2016; Berti and Mulligan, 2016). Some dealt with theory and practice (Sarmiento, 2017; Tregear, 2011), a few focused on the links between AFNs and a more sustainable UFS but many did not consider resilience (Forsell and Lankoski, 2015; Maticena, 2016). In general, the literature indicated that AFNs have a positive role in UFS that has the potential to be expanded, although there are significant barriers to overcome. The objective of this paper is to explore links between AFNs and sustainable/resilient UFS by way of an international systematic literature review. The next section outlines the methods used in this research. This is followed by the results and analysis sections. The paper concludes with suggestions for policy change and future research.

2 Methods

A systematic literature review was conducted to evaluate the role of AFNs in the pursuit of sustainable/resilient UFS and the implications for local food policies. The method adopted is a transparent process with clear boundaries that allows for some quantification and can be replicated (Tranfield et al., 2003). A search was carried out using the term "*alternative food networks*" in Scopus (which produced 200 items) and Web of Science (resulting in 170 items). Papers that discussed the contribution of AFNs to sustainable and resilient outcomes of UFS were analysed (Table 1). The papers were classified according to: their method (a review, case study, or survey); the type of AFNs that they studied; and, the location of the study.

A set of desired sustainable and resilient outcomes were derived from and applied to the analysis of the literature (see Table 1). The software NVivo 11 was used to carry out the analysis with outcomes encoded as nodes that were evaluated using the scheme in Table 2.

Table 1: External dimensions and related outcomes for sustainable and resilient UFS

External Dimensions	Outcome	Description
Socio-economic dynamics	Access to healthy food for all	People in all socioeconomic conditions should have equal access to healthy food (Donovan et al., 2011; Jennings et al., 2015; Moragues-Faus and Morgan, 2015).
	Diversity	Diversity of food sources, actors, networks, and markets must be pursued, creating a system with different options of choice (Carey, 2013; Edwards and Mercer, 2010; James and Friel, 2015).
	Connectivity between urban and rural areas	Resources should flow both ways be it in the form of food, economic support, or knowledge (Anderson, 2015; Cretella and Buenger, 2016; Dubbeling et al., 2016; Morgan and Sonnino, 2010).
	Generation, transfer, and use of food knowledge and skills	Knowledge on food growth, conservation, preparation, and uses need to be disseminated (Prosperi et al., 2015; Sonnino et al., 2014).
Physical urban structures	Local food supply	There is a need to increase food growth in urban and peri-urban areas (Brinkley, 2013; Desmarais and Wittman, 2014; Dowding-Smith, E., 2013; Longo, 2016).
Natural environment	Reduced food loss and waste	Reduce food waste in the whole UFS, from production to disposal (Carey, 2013; Jegou and Carey, 2015).
	Reduced GHG emissions	Reduce GHG related with the UFS (James and Friel, 2015; Sonnino et al., 2014).
	Environmental protection	UFS should maintain ecosystem services, conserve, protect, and regenerate natural resources and biodiversity (James and Friel, 2015; Sonnino et al., 2014).
Governance processes	Participative decision-making	Decision-making process should incorporate communities' interests and values, involve different actors (businesses, academics, government and consumers) and seek to distribute risks and benefits (Calori et al., 2017; Cretella, 2016; Moragues-Faus et al., 2016).

Table 2. Evaluation Scheme

Code	Category	Description
N	Does not contribute	The paper presents qualitative or quantitative evidence that this AFN cannot contribute to achieving the investigated outcome.
U	Unsure of contribution	The paper does not have a clear evidence regarding the achievement of the investigated outcome by the AFN. This also includes cases where both positive and negative aspects were mentioned.
C	Contribute	The paper presents qualitative or quantitative evidence that this AFN can contribute to achieve the investigated outcome.

3 Results and Discussion

Fifty academic papers that involved case studies from twenty-two different countries were reviewed (see Table 3). The majority came from the USA (7), Canada (6), and the UK (5). Farmers' markets (10) and Community Supported Agriculture (CSA) (10) were the types of AFNs most frequently investigated. Table 4 summarises the main findings: the dimensions and outcomes listed in this table were derived from a thematic analysis of the literature. It should be noted that there are many issues relating to UFS and urban needs, however, this paper focusses on the role of AFNs in striving for sustainability and resilience because of the limited space available.

Table 3: Case studies included in the review

#	Publication	Location	AFN type
1	Saulters et al., 2018	USA	General
2	Moragues-Faus, 2017	Spain	Buying group
3	Bellante, 2017	Mexico	General
4	Pinna, 2017	Italy; Spain	General
5	Rossi, 2017	Italy	General
6	Thornton, 2017	Australia	Community gardens
7	Watson and Ekici, 2017	Turkey	Box schemes
8	Miralles et al. 2017	Spain	General
9	Pellicer-Sifres et al. 2017	Spain	Buying group
10	Kopczynska, 2017	Poland	Farmers' market
11	Plieninger et al., 2017	Europe	General
12	Turner et al., 2016	Bolivia	general
13	Balázs et al., 2016	Hungary	CSA
14	Chiffolleau et al., 2016	France	Farmers' market
15	Longo, 2016	USA	Urban agriculture
16	Rover et al., 2016	Brazil	Agroecology Network
17	Schumilas and Scott, 2016	China	general
18	Schneider et al., 2016	Brazil	General
19	Doernberg et al., 2016	Germany	General
20	Lambert-Pennington and Hicks, 2016	USA	Farmers' market
21	Le Velly and Dufeu, 2016	France	CSA
22	Forssell and Lankoski, 2016	Finland; UK	General
23	Hedberg, 2016	USA	Farmers' market
24	Bloemmen et al., 2015	Belgium	CSA
25	Thorsøe and Kjeldsen, 2015	Denmark	Food hubs
26	Blumberg, 2015	Lithuania	Farmers' market
27	Si et al., 2015	China	General
28	Nigh and González Cabañas, 2015	France; Mexico	Farmers' market
29	Lagane, 2015	France	CSA

#	Publication	Location	AFN type
30	Miller, 2015	UK	General
31	Ghose and Pettygrove, 2014	USA	Community gardens
32	Dansero and Puttilli, 2014	Italy	General
33	Wilson, 2013	Canada	CSA
34	Lutz and Schachinger, 2013	Austria	Food hubs
35	Spilková and Perlín, 2013	Czechia	Farmers' market
36	Fonte, 2013	Italy	Buying group
37	Galt, 2013	USA	CSA
38	Paül and McKenzie, 2013	Spain	General
39	Beckie et al., 2012	Canada	Farmers' market
40	Hergesheimer and Wittman, 2012	Canada	General
41	Franklin et al., 2011	UK	Food hubs
42	Freidberg and Goldstein, 2011	Kenya	Box schemes
43	Levkoe, 2011	Canada	General
44	Sumner et al., 2010	Canada	CSA
45	Khan, 2010	UK	General
46	Jarosz, 2008	USA	General
47	Girou, 2008	France	CSA
48	Sonnino and Marsden, 2006	UK	General
49	Ilbery and Maye, 2005	UK	General

Table 4: Summary of the review findings

Dimension	Outcome	Total	Evaluation		Publications	Summary of the main points
Socio-Economic dynamics	Access to healthy food for all	28	N	6	14, 20, 27, 28, 42, 50	Unfavourable geographical location, high prices, and lack of inclusiveness of different classes and races.
			U	12	3, 6, 7, 11, 15, 17, 18, 22, 24, 31, 33, 44	Healthy food is available but is not clear who has access to it.
			C	10	1, 2, 4, 5, 9, 13, 26, 30, 34, 36	Focus on social justice and equality aspects, going beyond economic profit.
	Diversity	19	N	7	13, 19, 22, 27, 35, 41, 42	Dependence on seasonality does not allow variety of products and might not attend consumers' expectations.
			C	12	1, 2, 4, 11, 16, 26, 28, 32, 36, 45, 46, 47	Diversification of crops due to agroecology and diversity of food supply sources to urban areas.
	Connectivity between urban and rural areas	16	N	5	17, 21, 25, 27, 42	Sense of community is not present.
			U	2	10, 47	Consumers are interested only in some aspects of the food system.
			C	9	5, 12, 18, 19, 26, 29, 34, 37, 40	Direct links are created between produces and consumers and there is a concern with each other's well-being.
Generation, transfer, and appropriate use of food knowledge and skills	22	C	22	1, 5, 9, 12, 13, 15, 16, 17, 19, 24, 27, 30, 31, 33, 34, 38, 40, 42, 43, 45, 47, 48	AFN allow dissemination of knowledge on food growth, cooking, preserving, and storage; understanding of food systems; and exchange of knowledge on local products and culture.	
Physical urban structures	Local food supply	23	N	1	14	Inexistence of local producers.
			U	5	11, 18, 28, 30, 32	AFN not always based on local food supply and some items need to be supplied from global markets.
			C	17	4, 5, 8, 10, 12, 13, 15, 19, 22, 24, 26, 34, 37, 40, 42, 43, 47	Use of local supply for obtaining fresher products; know the origin of products; support local farmers; reduce GHG emissions; and diminish vulnerability.
Natural environment	Reduced food loss and waste	6	U	1	19	Food loss was identified during harvest in a CSA.
			C	5	13, 24, 33, 34, 36	The production meets a real demand and members are more aware of the issue of food loss and waste.
	Reduced GHG emissions	2	C	2	36, 37	Reduction of emissions from transport.
	Environmental protection	29	N	1	12	The AFN created a demand for local products that was not accompanied by adequate use of local resources.
			U	3	21, 23, 49	Packaging could improve and production methods not often sustainable.

Dimension	Outcome	Total	Evaluation	Publications	Summary of the main points
			C 25	2, 4, 5, 9, 11, 13, 14, 15, 16, 19, 22, 24, 26, 27, 28, 29, 30, 34, 36, 37, 39, 42, 43, 45, 47	Contributing factors: use and support of agroecology, reduction of packaging, food waste avoidance, and encouragement of less resource intensive diets.
Governance processes	Participative decision process	16	N 3	13, 17, 25	Consumers want more transparency and lack of inclusion of farmers.
			U 1	8	Large number of members makes it difficult for all to participate.
			C 12	2, 4, 5, 9, 15, 16, 21, 31, 33, 34, 36, 43	Use of democratic and horizontal decision-making process, and decisions regarding production and revenue allocation occur in a collective way.

*N - does not contribute, U - unsure of contribution, and C – contributes.

3.1 Socio-economic dynamics

3.1.1 Access to healthy food for all

Accessibility to nutritional food is a desirable public health outcome but may be an issue for lower-income groups (HLPE, 2017). Of the twenty-eight studies that discussed this outcome, eleven stated that AFNs are providing healthier food and enhancing accessibility (Balázs et al., 2016; Blumberg, 2015; Fonte, 2013; Lutz and Schachinger, 2013; Miller, 2015a; Moragues-Faus, 2017; Pellicer-Sifres et al., 2017; Pinna, 2017; Rossi, 2017; Saulters et al., 2018). Saulters et al. (2018) argued that social justice and equality are more valued by AFNs than profits. Buyers' groups seem to make organic products more accessible by using the purchasing power of its members and engaging volunteers to reduce costs (Fonte, 2013; Moragues-Faus, 2017; Pellicer-Sifres et al., 2017).

Twelve studies noted that while AFNs make healthy food available, it may not be accessible to all (Bellante, 2017; Bloemmen et al., 2015; Forssell and Lankoski, 2016; Ghose and Pettygrove, 2014; Longo, 2016; Plieninger et al., 2017; Schneider et al., 2016; Schumilas and Scott, 2016; Sumner et al., 2010; Thornton, 2017; Watson and Ekici, 2017; Wilson, 2013). A community garden in the USA studied by Ghose and Pettygrove (2014) provided healthy food to marginalised residents, but emphasised need for individual effort and was only accessible to persons with certain physical abilities, knowledge, and the time to volunteer (Ghose and Pettygrove, 2014). Wilson (2013) pointed out that while AFNs can promote access and equality, most participants were white and middle class.

Six studies stated that AFNs do not promote access to healthy food because of their geographical location or difficult access (Ilbery and Maye, 2005), high prices (Franklin et al., 2011; Lambert-Pennington and Hicks, 2016; Nigh and González Cabañas, 2015; Si et al., 2015), and there were a few cases where inedible food was offered (Chiffolleau et al., 2016).

3.1.2 Diversity of food sources and UFS actors

Five case studies found that AFNs, increased the diversity of food outlets (Dansero and Puttilli, 2014; Fonte, 2013; Khan, 2010; Moragues-Faus, 2017; Saulters et al., 2018). In some cases they supplemented the mainstream supermarkets by providing different options or filling gaps (Fonte, 2013; Khan, 2010; Moragues-Faus, 2017) for both consumers and producers (Dansero and Puttilli, 2014).

Most studies focused on the diversity of food available through AFNs, with eight highlighting crop diversification (Blumberg, 2015; Dansero and Puttilli, 2014; Girou, 2008; Jarosz, 2008; Nigh and González Cabañas, 2015; Pinna, 2017; Plieninger et al., 2017; Rover et al., 2016). Ten studies claimed that AFNs fall short in supplying product diversity due to seasonality (Doernberg et al., 2016; Franklin et al., 2011; Spilková and Perlín, 2013) or the AFNs' inability to meet consumer expectations (Balázs et al., 2016; Forssell and Lankoski, 2016; Freidberg and Goldstein, 2011; Si et al., 2015).

3.1.3 Connectivity between urban and rural areas

There is a disconnection between urban consumers and rural food producers (Anderson, 2015; Cretella and Buenger, 2016; Dubbeling et al., 2016; Morgan and Sonnino, 2010). Sixteen studies found that this was reduced by the elimination of intermediaries that encouraged cooperation and the building of trust (Blumberg, 2015; Doernberg et al., 2016; Galt, 2013; Hergesheimer and Wittman, 2012; Lagane, 2015; Rossi, 2017; Schneider et al., 2016; Turner et al., 2016). This connectivity helped producers feel more appreciated and consumers to better understand food production (Lutz and Schachinger, 2013).

Two studies were uncertain about the improvement of connectivity. Girou (2008) found that consumers had only limited interest in UFS, making it difficult for connectivity to develop. Kopczynska (2017) reported that relationships between consumers and producers were still limited to an economic exchange (Kopczynska, 2017).

Five studies found no improvement in connectivity (Freidberg and Goldstein, 2011; Le Velly and Dufeu, 2016; Schumilas and Scott, 2016; Si et al., 2015; Thorsøe and Kjeldsen, 2015). In the box scheme developed in Kenya, for example, despite the efforts made (including trips to the farms and other opportunities for interaction), there was no real sense of community (Freidberg and Goldstein, 2011). Le Velly and Dufeu (2016) found that a CSA in France showed no indication that rural-urban connections were

improving due to the existence of intermediaries. In a study of food hubs in Denmark, producers did not recognise the benefits of interacting with consumers (Thorsøe and Kjeldsen, 2015).

3.1.4 Generation, transfer, and use of food knowledge and skills

Twenty-two studies suggested that AFNs can contribute to the generation, transfer, and use of food knowledge. There were no cases where this outcome was unsure or negative. Several studies highlighted the sharing of knowledge on sustainable food growing practices (Bloemmen et al., 2015; Freidberg and Goldstein, 2011; Ghose and Pettygrove, 2014; Girou, 2008; Longo, 2016; Miller, 2015; Paül and McKenzie, 2013; Rover et al., 2016; Schumilas and Scott, 2016; Si et al., 2015; Wilson, 2013) that can improve adaptive capacity (Anderson, 2015). AFNs also enabled consumers to better understand their food system and create new forms of organisation (Doernberg et al., 2016; Hergesheimer and Wittman, 2012; Khan, 2010; Levkoe, 2011; Lutz and Schachinger, 2013; Pellicer-Sifres et al., 2017; Rossi, 2017; Saulters et al., 2018; Sonnino and Marsden, 2006). They encouraged consumers to become more active actors in the food supply system (Hergesheimer and Wittman, 2012). When all actors understand the limitations of food production, such as seasonality, they are more likely to change their behaviour (Doernberg et al., 2016). Saulters et al. (2018) argued that this awareness is necessary for creating a fairer food system. AFNs were reported to foster the sharing of knowledge in cooking, preserving and storing food (Balázs et al., 2016; Lutz and Schachinger, 2013; Miller, 2015), as well as stimulate learning about local products and culture (Turner et al., 2016).

3.2 Urban structures

3.2.1 Local food supply

Most AFNs seek to supply their food from local producers (as indicated in seventeen from the twenty-three studies). The most common motivations were: having fresher products; knowing the origin of products; supporting local farmers; reducing GHG emissions; and, diminishing food supply vulnerability (Bloemmen et al., 2015; Blumberg, 2015; Doernberg et al., 2016; Freidberg and Goldstein, 2011; Galt, 2013; Girou, 2008; Hergesheimer and Wittman, 2012; Kopczynska, 2017; Levkoe, 2011; Longo, 2016; Miralles et al., 2017; Pinna, 2017). This creates a new form of organisation that enables connectivity and opportunities that are often lacking in typical UFS (Balázs et al., 2016; Lutz and Schachinger, 2013; Rossi, 2017; Turner et al., 2016). It is not just about having resources closer to the consumer, but also about more personal social interactions that enable sharing, cooperation, and exchanges between people (Forssell and Lankoski, 2016; Lutz and Schachinger, 2013). Rossi (2017) noted that this localisation generates a new social contract with its own rights and responsibilities. An example of this is how food hubs are able to use their own seeds and have control over price (Lutz and Schachinger, 2013). This indicates that a local food supply is as much about social justice and equity as reduced environmental impacts (Balázs et al., 2016; Lutz and Schachinger, 2013; Rossi, 2017).

Five cases did not focus strictly on local supply (Dansero and Puttilli, 2014; Ilbery and Maye, 2005; Plieninger et al., 2017; Schneider et al., 2016), and one was not sourcing locally (Chiffolleau et al., 2016). Nigh and González Cabañas (2015) contrasted the difference between France (where the support for local farmers is part of the policy in regional and national governments), and Mexico (where policies favour globalised supply chains). The lack of government support can make it difficult for small producers to maintain themselves so AFNs struggled to find local produce (Nigh and González Cabañas, 2015). Chiffolleau et al. (2016) found one case in France where the region's agribusiness was hindering the production of food of interest to local consumers (Chiffolleau et al., 2016). Other authors also reported problems where producers tailored their crops to suit international markets (Miralles et al., 2017; Turner et al., 2016).

3.3 Natural environment outcomes

Five studies found that AFNs reduced food loss and waste because: production was driven by demand (Bloemmen et al., 2015), excess produce was exchanged or donated (Balázs et al., 2016; Wilson, 2013), and there was a higher level of awareness of the issue (Fonte, 2013; Lutz and Schachinger, 2013). However, the study of a CSA in Berlin by Doernberg et al. (2016) was classed indeterminate because the level of food losses during harvest time was considered to be high.

Only two studies considered the reduction of GHG emissions. Fonte (2013) and Galt (2013) found that local production and consumption reduced transport emissions. AFNs also have the potential to encourage less carbon-intensive diets and a less wasteful supply chain.

Twenty-nine studies considered the environmental implications of AFNs. Eighteen stated that AFNs use agroecology and organic production practices as a way to protect ecosystems (Balázs et al., 2016; Beckie et al., 2012; Bloemmen et al., 2015; Blumberg, 2015; Chiffolleau et al., 2016; Doernberg et al., 2016; Forssell and Lankoski, 2016; Freidberg and Goldstein, 2011; Galt, 2013; Girou, 2008; Lagane, 2015; Longo, 2016; Miller, 2015; Nigh and González Cabañas, 2015; Pinna, 2017; Plieniger et al., 2017; Rover et al., 2016; Si et al., 2015). Miller (2015) identified the creation of conservation areas in the production zone as protecting biodiversity. Even AFNs that were not involved with food production promoted sustainable agriculture by seeking sources of food that used environmentally sound practices (Fonte, 2013; Khan, 2010; Levkoe, 2011; Lutz and Schachinger, 2013; Moragues-Faus, 2017; Pellicer-Sifres et al., 2017; Rossi, 2017). Others reduced packaging, avoided food waste, and encouraged less resource intensive diets (Lutz and Schachinger, 2013).

Three case studies were indeterminate regarding AFNs' role in protecting ecosystems. Le Velly and Dufeu (2016) found that issues such as packaging remained a problem. Few of the initiatives investigated by Ilbery and Maye (2005) were actually achieving environmental benefits. Hedberg (2016) found that the small scale at which they operated was not sufficient to generate benefits for whole ecosystems. Turner et al. (2016) also found that AFNs were not protecting surrounding ecosystems.

3.4 Governance processes

3.4.1 Participative decision-making

Sixteen studies dealt with participative decision-making with twelve reporting a positive effect (Ghose and Pettygrove, 2014; Le Velly and Dufeu, 2016; Longo, 2016; Pinna, 2017; Rover et al., 2016; Wilson, 2013). One of the main goals of AFNs is to enable new forms of organisation that promote transformative food policies (Levkoe, 2011; Rossi, 2017). The participative decision-making process reported in Italian and Spanish buying groups was considered to be the main factor in transforming values that supported democratic and horizontal decision-making built on relations of trust, cooperation and friendship (Fonte, 2013; Moragues-Faus, 2017; Pellicer-Sifres et al., 2017). Moragues-Faus (2017) found that some AFNs members may not have time to engage in these deliberations. Nevertheless, the empowerment of consumers and producers in the decision-making process enables the achievement of socially equitable outcomes (Lutz and Schachinger, 2013; Rossi, 2017). Other positives included improved engagement and responsibility (Pellicer-Sifres et al., 2017).

Miralles et al. (2017) found that AFNs with larger memberships had more difficulty in establishing a collective decision-making process and three studies found that AFNs were not participative (Balázs et al., 2016; Schumilas and Scott, 2016; Thorsøe and Kjeldsen, 2015). Balázs et al. (2016) found that the levels of participation by consumers were inadequate. Consumers would have liked a more transparent process, but farmers believed that members did not have enough expertise (Balázs et al., 2016). Schumilas and Scott's (2016) study in China, found farmers treated as labourers with no attempt to integrate them into decision-making.

4 Final Remarks

This review has made three main contributions to the pool of knowledge. First, it systematically evaluated the contribution of AFNs to the pursuit of sustainable and resilient UFS. The more successful aspects were: the generation, transfer, and use of food knowledge and skills; the protection of surrounding ecosystems; the promotion of more participative decision-making; the development of local food supply; and, the improvement of connectivity between rural and urban areas. Enhancing knowledge of food issues can help to improve the management of resources and build resilience to extreme weather events. The capacity of AFNs to generate connections can also be of great value. Hence the literature indicates that overall AFNs contribute to sustainable and resilient UFS and are worth expanding.

Second, to improve AFNs' impact there is a need to increase access to healthy food and the diversity of food products. Buyers' groups and food hubs sometimes improved access but results varied across the

different types of AFNs. Urban food strategies could provide incentives for AFNs to improve access to healthy food by people from lower socio-economic groups. AFNs can also promote the diversification of food sources if given encouragement, something that can assist in the re-establishment of food supply in case of shocks.

Finally, AFNs are capable of reducing GHG emissions, as well as food loss and waste, but this needs further research. More work should also be done on the role of AFNs in resilience building through improved knowledge transfer, connectivity, and diversity. This includes studies investigating the relevance of local policies when planning for climate change adaptation.

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