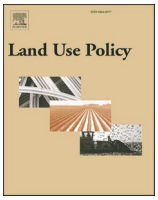
Land Use Policy 126 (2023) 106529

Contents lists available at ScienceDirect

Land Use Policy

journal homepage: www.elsevier.com/locate/landusepol



Sustainability assessment of Territorial Short Food Supply Chains versus Large-Scale Food Distribution: The case of Colombia and Spain

Liliana Reina-Usuga [a,*], Carlos Parra-López [b], Tomás de Haro-Giménez [c], Carmen Carmona-Torres [b]

[a] University of Malaga, Department of Economics and Business Management, Campus El Ejido, P.O. Box 29016, Malaga, Spain
[b] Institute of Agricultural and Fisheries Research and Training (IFAPA). Department of Agrifood System Economics, Centre 'Camino de Purchil', P.O. Box 2027, 18080 Granada, Spain
[c] University of Cordoba. Department of Economics, Sociology and Agricultural Policy, Campus de Rabanales, P.O. Box 14071, Cordoba, Spain

ARTICLE INFO

Keywords:
Alternative Food Networks
Territory
Sustainable food systems
Territorial resilience
Food supply chains
Food governance

ABSTRACT

Assessing, designing and implementing more sustainable agri-food systems has become a high priority in scientific research and political agendas worldwide. The ongoing Russia-Ukraine conflict is highlighting the fragility of globalised food distribution systems, and there is a need to focus on alternatives. This manuscript assesses the sustainability of two largely opposing marketing alternatives, namely Territorial Short Food Supply Chains (TSFSCs) and Large-Scale Food Distribution (LSFD). Specifically, the cases of Bogota (Colombia) and Cordoba (Spain) are analysed, where the development of TSFSCs has very significant in recent years but which are of a very different nature. For this purpose, a multi-criteria model based on the Analytic Network Process (ANP) methodology has been developed, considering multiple economic, social and environmental criteria. The model has been evaluated by four interest groups. The results show that the social sub-criterion – distribution of added value – is highly prioritised, and that the TSFSCs are the most sustainable alternatives globally in both cities. In Bogota, direct sales (farmers market) are prioritised, whilst in Cordoba, chain with a local retail (specialised shops). The contribution of TSFSCs to ecosystem services, equity, territorial cohesion and the revitalisation of the economy is highlighted. By interest groups, civil society, academia and public administration prioritise TSFSCs. However, the market players in Cordoba prioritise LSFD with national product. The results indicate that TSFSCs have the potential to contribute to the consolidation of sustainable and resilient food systems.

1. Introduction

The current urban agri-food system is in a bimodal dynamic. Part of the food that arrives in cities flows through the Globalized Food System (GFS), and another part flows through Alternative Food Networks (AFNs) (Galli et al., 2016; Renting et al., 2012). These dynamics run in parallel and at the same time are opposed, since they operate under different logics, and show the intrinsic strengths and weaknesses of each production, distribution and consumption model (Lamine et al., 2019; Trivette, 2019). The configuration in each city of its own agri-food system depends on a wide variety of territorial factors. Some cities are particularly susceptible to supply problems because of limited diversification of value chains and supply channels, high or exclusive dependence on food imports, and long and complex supply chains that are perennially vulnerable to sudden shocks, whether due to social, political, economic or natural events (FAO-RUAF, 2020).

Despite in-depth academic debates to define and delimit each of these modalities of the agri-food system, the boundaries remain blurred. Food supply chains are rarely completely local or global (Galli et al., 2016). The scientific literature refers mainly to five elements to differentiate each model: 1) the number of linkages (agents) involved; 2) the governance processes they shape; 3) the geographical distance; 4) the

Abbreviations: ANP, Analytical Network Process; TSFSC, Territorial Short Food Supply Chain; DANE, National Administrative Department of Statistics - Colombia; DNP, National Planning Department - Colombia; LSFD, Large-Scale Food Distribution; MAPAMA, Ministry of Agriculture and Fisheries, Food and Environment of Spain; UNDP, United Nations Development Programme; AFN, Alternative Food Network; GFS, Global Food System.

* Corresponding author.
E-mail address: liliana.reina@uma.es (L. Reina-Usuga).

https://doi.org/10.1016/j.landusepol.2022.106529
Received 2 April 2022; Received in revised form 13 December 2022; Accepted 22 December 2022
Available online 30 December 2022

type of production; and 5) the quality of food flowing through the chains (Brunori and Galli, 2016; Fabbrizzi et al., 2014; Reina-Usuga et al., 2018; Renting et al., 2003; Rivera et al., 2020).

GFS is the mainstream form of food supply. It is located under the globalized food regime or third food regime (Cid, 2007; Renting et al., 2012; Sonnino, 2016). GFS is characterized by long supply chains that configure the well-known Large-Scale Food Distribution (LSFD) (Goodman et al., 2012), with products coming from mega-farms located in distant places, and sometimes unknown to the final consumer (IPES-Food, 2017; Marsden, 2017). LSFD have standardised production and distribution systems, which often include supermarket chains as retailers for final consumers (Ericksen, 2008; Ilbery et al., 2004; Michel-Villarreal et al., 2019), and foster vertical integration of supply chains (IPES-Food, 2017; Moragues-Faus et al., 2017).

On the other hand, the AFNs are embedded in specific territories (González et al., 2012), and promote social encounters between production and consumption of differentiated foods (i.e. ecological, traditional, artisanal, etc.), short distribution networks, and the implementation of ecologically rational production and distribution practices (Feenstra, 1997; Reina-Usuga et al., 2018). Currently, Territorial Short Food Supply Chains (TSFSCs) are among the most popularised forms of AFN.

TSFSCs emerge from singular and particular territorial factors that imprint their uniqueness (Reina-Usuga, 2022) and are defined as forms of rural-urban interaction of agents of the food chain with objectives related to sustainability and food governance (Reina-Usuga et al., 2018). TSFSCs foster spaces of deliberation that bring together civil society, private agents, and local government, facilitating processes of learning and collective action (Reina-Usuga et al., 2020).

Factors such as the growth of urban areas and rural depopulation (FAO, 2019; Liu et al., 2020), natural resource degradation and climate change (IPCC, 2019), social and economic inequality (El Bilali, 2019; Fonte and Cucco, 2017), concentration of power in the food industries (IPES-Food, 2017; Moragues-Faus et al., 2017), and sanitary emergency situations, such as that caused by COVID-19 (FAO-RUAF, 2020; Nchanji and Lutomia, 2021), have highlighted the vulnerability of the GFS and the urgent need to move towards more sustainable and resilient agri-food systems. Promoting sustainability in food systems involves creating socially, economically and ecologically sustainable and resilient synergies between the different agents involved (Marsden and Morley, 2014). The results of these interactions influence different geographies and social groups (Moragues-Faus et al., 2017). Thus, sustainability assessment has become a rapidly developing scientific area, and its main aim is to provide decision makers with an assessment of society-nature systems, integrated locally and globally, and in a short and long-term perspective, to help them pin down what actions should or should not be taken in an attempt to make a society more sustainable (Blay-Palmer et al., 2020; Ness et al., 2007). Defining and prioritising specific criteria to assess such sustainability goes beyond the boundaries of disciplinary and interdisciplinary sciences, given the involvement of different scales, balances and interests (Marsden, 2017).

Evaluations of the sustainability of GFS and AFNs are sometimes inconclusive, given the very controversial nature of sustainability (Gava et al., 2014; Michel-Villarreal et al., 2019). The most accepted definition in the political and academic field is that proposed by the Brundtland report, which refers to sustainable development as the ability to meet the needs of the present without compromising the ability of future generations to satisfy their own needs, and consists of three dimensions: economic, social and environmental (World Commission on Environment and Development, 1987). Taking this definition as a reference, the scientific literature has developed different methodological approaches to assess sustainability, which can be classified into three main groups: 1) assessments that make use of indicators/indexes as an assessment tool (Gasparatos, 2010; Carvalho et al., 2021); 2) product-related assessments, focusing on material flows and/or energy during the production and/or consumption of goods and services, the best known of these methodologies being Life Cycle Assessment (Schader et al., 2014); and 3) integrated assessments, which are used to support decisions related to a policy or project at a specific scale (Sala et al., 2015). A wide range of integrated assessment tools are available, including multi-criteria analysis, risk analysis, vulnerability analysis and cost-benefit analysis (Ness et al., 2007; Hebinck et al., 2021).

Studies on the sustainability of food systems often focus only on some dimension of sustainability, which makes it challenging to develop robust theories of sustainable food systems (Forssell and Lankoski, 2014; Hebinck et al., 2021; Michel-Villarreal et al., 2019;). In general, it has become clear that most research on sustainability in the AFNs has focused on the social dimension, followed by the economic and lastly the environmental dimension. This is in contrast to the GFS sustainability studies, which are mainly based on the environmental dimension, followed by the economic and social dimension (Hebinck et al., 2021; Michel-Villarreal et al., 2019; Schader et al., 2014). The methodological approaches proposed in some food systems sustainability studies refer to the assessment of the food value chain in its different linkages.

Although the methodological approaches proposed in some studies of sustainability of food systems refer to the assessment of the food value chain in its different links (SAFA, 2013) and, in some cases, with particular specifications for some agri-food products (Galli et al., 2016; Kirwan et al., 2016), the short and global agri-food chains have not been integrally evaluated in relation to their contribution to the sustainability of the territory in which they are developed.

An integrated assessment requires the participation of the different stakeholders as part of its process (Galli et al., 2016; Sala et al., 2015), which allows the inclusion of multiple knowledge and values from stakeholders (Galli et al., 2016; Gasparatos, 2010) and the identification of joint and territory-specific solution proposals. The specific case of assessing the sustainability of different forms of food supply chains to cities, involves taking into account a wide variety of criteria and interest groups, so multi-criteria methodologies are very appropriate. The main advantage of this type of methodology is that it allows for the consideration of a large number of data, relationships and objectives, frequently contradictory, that are often present in decision making, linked to real world problems (Martinez-Alier et al., 1998). Among the methodologies that incorporate the integrated approach to analysis, the Analytic Network Process (ANP) stands out as a technique that allows the simultaneous consideration of all the interdependencies between the different relevant elements that compose the system under study.

This research aims to contribute to this methodological and empirical lack, through an integrated assessment of the sustainability of two largely opposing food chains: a) Large-Scale Food Distribution (LSFD), as a form of GFS; and b) Territorial Short Food Supply Chains (TSFSCs) as a type of AFN. Within each of these alternatives, two modalities are considered, thus assessing four forms of food chain in the cities: A1) LSFD with imported food; A2) LSFD with national food; A3) TSFSC with a local retailer and local food; and A4) TSFSC by direct selling and local food. In order to achieve this, a multi-criteria model has been designed using the ANP multi-criteria methodology. The model has been evaluated in the cities of Bogota (Colombia) and Cordoba (Spain) where the development of TSFSCs has very significant in recent years, but which are of a very different nature. This adds value to this research by contrasting specific characteristics of each city. The model allows a quantitative evaluation of the priorities that different interest groups attribute to different sustainability criteria and sub-criteria, in order to prioritise the most globally sustainable food chain in each city.

2. Materials and methods

2.1. Case studies

The selection of these case studies is justified by: i) the food bimodality, i.e. the prevalence of the GFS and a growing emergence of AFNs in the last decade in each city; ii) the significant differences in

demographic and geographical variables between the two cities, which allow the results of the assessment to be contrasted. They are described below.

2.1.1. Bogota (Colombia)

Colombia is a predominantly rural country, with a population of 49,758,682 (DANE, 2018), of which 31.6 % live in rural areas and about 14 % are considered peasants (UNDP, 2011). Family farming represents approximately 40 % of the crop area and 43 % of the production value (DNP, 2015). It is estimated that in cities such as Bogota, Medellín and Cali, about 65 % of the food consumed comes from peasant economies (Gutiérrez, 2016).

Bogota as the capital concentrates 16.44 % of the national population (DANE, 2018); and its fruit and vegetable supply system is focused on the Central de Abastos de Bogota, Corabastos. This central supplies almost 100 % of the city's neighbourhood shops, marketplaces and specialized shops, representing between 60 % and 65 % of the city's final consumption (Galindo, 2015). At the public policy level, since 2006 the city has had a regulation for food supply, called the Master Plan for Food Supply and Security in Bogota (PMASAB), which includes the management of rural networks, urban networks, logistical equipment and a strategy to promote farmers market (AFN). Despite this, the initiatives linked to the AFN, many of which are outside of public policy and promoted by NGOs and universities, have been strengthened and diversified over the last decade (Reina-Usuga et al., 2022). The promotion of sustainable and resilient food systems in Bogota, and in Colombia in general, is a very important issue, as it is one of the pillars of the integrated rural reform proposed in the Peace Agreement signed in 2016.

2.1.2. Cordoba (Spain)

Andalusia occupies 17.4 % of the total surface area of Spain and is home to 18 % of the population. The rural area represents almost 80 % of the Andalusian territory, in which it stands out its specialization in olive grove, occupying 60.3 % of the Spanish state surface and 81.9 % of the physical production of olive oil. Vegetables, fruits and olive groves lead Andalusian production (Junta de Andalucía, 2020). In 2016, Andalusia was the first autonomous region to receive CAP support, reaching 28.1 % of the state total (Massot, 2016).

In 2018, Spain has become the EU 28 country with the largest area of land under cultivation for organic production, reaching 16.7 %. Andalusia is the leading region with 45.6 % of the national total, and Cordoba represents 16.1 % of the regional area (Junta de Andalucia, 2020). In terms of marketing, throughout Andalusia there has been an increase in the number of wholesale and retail establishments specialising in the sale of organic products (MAPAMA, 2015).

The city of Cordoba has 328,718 inhabitants (Cordoba City Council, 2019) and is the third largest and most populated city in Andalusia. Its food supply system is centred on Mercacordoba, which provides 88 % of the supply of fresh products to local shops (Gallar and Vara, 2017). In 1994, the first cooperative of consumers of organic products was registered in the city, and in the last two decades the initiatives linked to the AFN have taken more widespread and proliferated. At the public policy level, the city of Cordoba joined the Milan Urban Food Policy Pact in 2016, and since then, sustainable, inclusive and resilient food systems have been prioritised on the local political agenda.

2.2. Sustainability assessment through the Analytic Network Process (ANP)

The Analytic Network Process (ANP) was proposed by Thomas L. Saaty (Saaty, 2001), and represents an evolution of the well-known multi-criteria method AHP (Analytic Hierarchy Process). The ANP allows modelling a multi-criteria decision-making problem as a network of decision elements (criteria, sub-criteria and alternatives) and clusters of elements, which can be interrelated with each other (Niemira and Saaty, 2004). Thus, the models proposed are closer to reality than in other methodologies with simpler and more linear models (Sánchez-Zamora et al., 2017). The scientific literature on the assessment of the sustainability of food chains alternatives using the ANP technique is very scarce or non-existent to our knowledge. In the agricultural field, some works on the multifunctional performance of cattle farms in the Netherlands (Parra-López et al., 2008), the multifunctionality associated with cultivation techniques in olive groves (Carmona-Torres et al., 2014), the impacts of the provision of public goods in olive groves (Villanueva Rodríguez et al., 2014) and the resilience factors of rural territories in Andalusia (Sánchez-Zamora et al., 2017) stand out.

The application of the ANP methodology for the integrated assessment of the sustainability of LSFD with regard to TSFSCs has been carried out through four consecutive phases, as specified below.

2.2.1. Modelling the problem as a network

The design of the network is one of the key points for the proper solution of a multi-criteria problem (Saaty, 2001). The basic units that composed the network are the elements (criteria, sub-criteria and alternatives) of the system analysed, which are grouped into clusters. Subsequently, the relationships between the elements that composed the network are identified. In this manuscript, the two indicated alternatives were identified, i.e. LSFD and TSFSCs. And two forms were established in each of these chains, so that four food chain alternatives have been evaluated. The criteria of the model correspond to the three dimensions of sustainability: economic, environmental, and social (United Nations, 2015). To identify the sub-criteria of sustainability, 23 exploratory personal interviews have been conducted, with a semi-structured questionnaire with open questions, to different actors/experts in the food sector (10 in Bogota and 13 in Cordoba). Based on the exploratory interviews and literature review (Adrianto et al., 2005; Brunori and Galli, 2016; Galli et al., 2016; Galli and Brunori, 2013; Kirwan et al., 2016; Schneider et al., 2016; Slätmo et al., 2017; Zahm et al., 2007) the ANP model has been designed (Fig. 1).

The defined model consists of 4 levels:

- Level I: It corresponds to the main objective, or goal, to be achieved in solving the decision-making problem. In this case, to assess the sustainability of the different food chains.
- Level II: It consists of the three sustainability criteria: economic, environmental, and social.
- Level III: It corresponds to the sub-criteria, which are the most specific items within each sustainability criterion, defined in detail in Annex I.
- Level IV: It consists of the possible alternatives to the problem posed. In this case, four alternatives that include different food chains (Table 1).

2.2.2. Design of the relationship matrix

Once the elements and clusters of the network have been defined, the possible relationships between these elements have been established. For this purpose, a matrix of influences has been defined, based on a literature review (Brunori and Galli, 2016; Galli et al., 2016; Kirwan et al., 2016; Schneider et al., 2016; Slätmo et al., 2017). The relationships between the elements of a ANP model can be represented as a supermatrix (Table 2). The sub-matrices of this supermatrix represent the relationships of contribution of some elements to others or, inversely, of dominance over others. A cluster is related to another cluster (external dependence) or to itself (internal dependence) if at least two elements of the cluster(s) are related through a domain relationship.

For instance, the vector of global sustainability of each alternative ($\mathbf{W_{A,G}}$) is calculated as: $\mathbf{W_{A,G}} = \mathbf{W_{A,SC}} \times \mathbf{W_{SC,SC}} \times \mathbf{W_{SC,C}} \times \mathbf{W_{C,C}} \times \mathbf{W_{C,G}}$. Thus, $\mathbf{W_{A,SC}}$ accounts for the outer contribution of the alternatives for each food chain (A) to achieve each sub-criteria (SC) (Table 2). $W_{A,SC}$ is shown as an example of a relationship sub-matrix for the case of Bogota

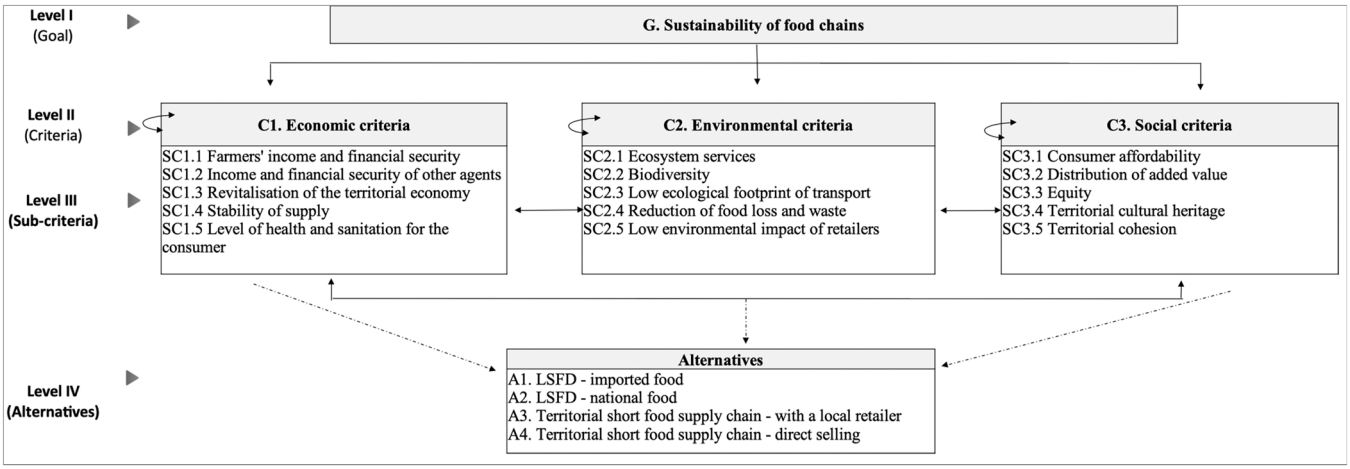


Fig. 1. ANP model for sustainability assessment in food chain.

Table 1
Alternatives of food chains in Bogota and Cordoba.

Alternatives	Code	Case	Concept	Actors	Type of production	Distance travelled
Large-Scale Food Distribution (LSFD)	A1	LSFD - imported food	It is constituted by four or more agents	1. Farmer 2. Local wholesaler 3. Importer 4. Retailer 5. Final consumer	Conventional production	4248 km (by air)
	A2	FSFD - national food	It is constituted by four or more agents	1. Farmer 2. Wholesaler 3. Retailer 4. Final consumer	Conventional and organic production	867–120 km
Territorial Short Food Supply Chain (TSFSC)	A3	TSFSC – with a local retailer	It is constituted by three-agent	1. Farmer 2. Local retailer 3. Final consumer	Organic/peasant production	92 km
	A4	A4. TSFSC – direct selling	It is constituted by two agents	1. Farmer 2. Final consumer	Organic/peasant production	92 km

Table 2
Supermatrix of the ANP model.

		G	C1	C2	C3	SC1. Economic sub-criteria					SC2. Environmental sub-criteria					SC3. Social sub-criteria					Alternatives			
		Sustainability	Economic criteria	Environmental criteria	Social criteria	SC1.1	SC1.2	SC1.3	SC1.4	SC1.5	SC2.1	SC2.2	SC2.3	SC2.4	SC2.5	SC3.1	SC3.2	SC3.3	SC3.4	SC3.5	A1	A2	A3	A4
G (Goal). Sustainability		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C1. Economic crireria C2. Environmental crireria C3. Social crireria		$W_{C,G}$	$W_{C,C}$			0					0					0					0			
SC1. Economic sub-criteria	SC1.1 SC1.2 SC1.3 SC1.4 SC1.5	0	$W_{SC1,C1}$	0	0	$W_{SC,SC}$															0			
SC2. Environmental sub-criteria	SC2.1 SC2.2 SC2.3 SC2.4 SC2.5	0	0	$W_{SC2,C2}$	0																			
SC3. Social sub-criteria	SC3.1 SC3.2 SC3.3 SC3.4 SC3.5	0	0	0	$W_{SC3,C3}$																			
Alternatives	A1 A2 A3 A4	0	0	0	0	$W_{A,SC}$															I			

(see Annex II.a, bottom rows). It can be seen that the performance of alternative A1. LSFD – imported food in SC1.1 farmer' income and financial security is 0.1718; and that the alternative that contributes most to SC1.1 is A4. TSFSC – direct selling with a performance of 0.3263. Otherwise, $\mathbf{W_{SC,SC}}$ represents the inner relationships or interrelations between sub-criteria (SC); for instance, farmer' income and financial security (SC1.1), can contribute to low environmental impact of retailers (SC2.5). $\mathbf{W_{SC,C}}$ accounts for the outer contribution of each sub-criteria (SC) to achieve its own criteria (C); for instance, farmer' income and financial security (SC1.1), can contribute to economic criteria (C1). $\mathbf{W_{C,C}}$ represents the inner relationships or interrelations between criteria; for instance, the economic criteria (C1) can contribute to the social criterion (C2). $\mathbf{W_{C,G}}$ accounts for the outer contribution of each criteria (S) to achieve the model's goal, in this case the sustainability; for instance the economic criteria (C1)) can contribute to the sustainability. Finally, **I** is a unit sub-matrix that shows that the alternatives are internally independent from a dominance/contribution point of view. That is, the alternatives are not interrelated. The elements of any column in each sub-matrix are standardised in ANP, i.e., they add up to 1.

2.2.3. Assessment of the model

Once the network has been described and the possible relationships between its elements established, the next step is to evaluate these relationships quantitatively. That is, to determine the relative priorities (or contributions) of the different elements (criteria, sub-criteria, and alternatives) with respect to the element that dominates them, i.e., on which they depend (Saaty and Takizawa, 1986). In ANP questionnaires, elements are normally compared in pairs when the model has between 5 and 9 elements to compare. However, it is also possible, when the number of comparisons is greater, 15 sub-criteria in this research, to use a direct rating, for practical purposes of time and to avoid inconsistencies in responses (Bottomley and Doyle, 2001; Carmona-Torres et al., 2014). The contribution of one element to another on which it depends has been obtained using a direct rating scale ranging from 1 (very weak contribution) to 9 (very strong contribution) (Carmona--Torres et al., 2014). This direct scale is equivalent to a rating scale in ANP where the 9 scale point is 9/1 times greater than the 1 scale point, 9/2 times greater than 2, and so on. Obtaining this information has required formulating the questionnaire to experts in the food system of Bogota and Cordoba. Due to the requirement of deep technical knowledge and availability to complete long questionnaires, the number of experts to be consulted in the ANP methodology is commonly reduced, usually from 6 to 15 (Sánchez-Zamora et al., 2017; Villanueva Rodríguez et al., 2014).

For this research, 28 agents/experts were interviewed, 14 in Bogota and 14 in Cordoba (some of them participated in the design phase (Section 2.2.2)), clustered in different interest groups (Table 3). It is important to point out that in the selection of the experts it was considered that they were not directly related to the food chain alternatives to be assessed (LSFD and TSFSCs) in order to avoid bias in their ratings. The selection criterion was the experience and/or knowledge of the agri-food system in each city as a whole. The interest groups are:

- Civil society: Representatives of civil society organisations such as NGOs, social groups and banks, among others.
- Academia: Members of higher education institutions and/or research centres.
- Market: Agents in the food supply chain, in the production, distribution or commercialization link. Market experts were the group least willing to answer the questionnaire. Thus, given the scope of the research in resources and time, and the limited interest of this group in the research, it is the group with the least number of experts.
- Public administration: Representatives of public administration entities at local and/or regional level.

Table 3
Agents/experts consulted by interest groups.

City	Civil society	Academia	Market	Public administration	Total interviews
Bogota	4	4	2	4	14
Cordoba	3	5	2	4	14

2.2.4. Calculation of the priorities of the elements

Based on the previous evaluations, for each expert a supermatrix of relations is obtained. It contains all the sub-matrices of relationships ($\mathbf{W_{A,SC}}$, $\mathbf{W_{SC,SC}}$, $\mathbf{W_{SC,C}}$, $\mathbf{W_{C,C}}$ and $\mathbf{W_{C,G}}$) according to the evaluations indicated by the experts, having 28 individual supermatrices in total. These individual supermatrix were aggregated and an aggregated supermatix was obtained. In order to obtain the aggregated results, which synthesize the joint knowledge of the panel of experts interviewed, the aggregation of individual priorities (AIP) was used for each sub-matrix, following the criteria of Forman and Peniwati (1998), who recommend its use when the people who compose the panel express their opinions in an individual capacity. Thus, on the one hand, the aggregated supermatrices were calculated for each interest group, and then the total aggregated supermatrix considering equally the supermatrices of each group (Annex II). The aggregated supermatrices were then multiplied in parts, as proposed by Carmona-Torres et al. (2014), to obtain the priorities of each element for the different interest groups and at a total level.

It is important to highlight the fact that previous calculate $\mathbf{W_{A,G}}$ (the assess of each food chain alternative), the prioritisation of each sub-criteria is calculated as: $\mathbf{PW_{SC}} = \mathbf{W_{SC,SC}}$ x $\mathbf{W_{SC,C}}$ x $\mathbf{W_{C,C}}$ x $\mathbf{W_{C,G}}$. This prioritisation gives the weighting of each sub-criteria, to be considered in the subsequent evaluation of each alternative. For instance, in Bogota could be prioritised the farmer' income and financial security (SC1.1) as the sub-criteria with the highest importance for a sustainable food chain. However, in Bogota a food chain alternative with a low performance in sub-criterion SC1.1 can be prioritised because the prioritisation of the alternative depends on the sum of the alternative's performance in each sub-criterion.

3. Results

The results are divided into two main sub-section. First, the prioritisation of sustainability criteria and sub-criteria of food chain in Bogota and Cordoba are analysed, i.e., what is important for cities to assess sustainability (in Section 3.1). And consecutively, the evaluation of each food chain alternative, based on the previous prioritisation of criteria and sub-criteria, are analysed (from Section 3.2). The results presented here refer to the total priorities, obtained as an average of the averages of the different interest groups, i.e., taking into account the preferences of all the interest groups equally.

3.1. Prioritisation of sustainability sub-criteria and criteria

Both cities attribute the greatest importance to *SC3.2 distribution of added value* created in the food chain, which is a social sub-criterion, and to *SC1.2 income and financial security of other agents,* which is economic (Fig. 2). This could highlight the importance of the activities carried out by the intermediate links to connect the rural area with the urban area, such as the aggregation and disaggregation of supply, transportation and physical distribution. *SC2.4 reduction of food loss and waste* is also a high priority in both cities. In the experts' opinion, the importance of this sub-criterion goes beyond what it represents as waste of resources used in production (land, water, energy and inputs), pollution and unnecessary generation of CO_2, and is linked to the decrease in income of both farmers and other agents in the chain. The main differences in the two cities are found in the sub-criteria *SC2.1 ecosystem services, SC2.2*

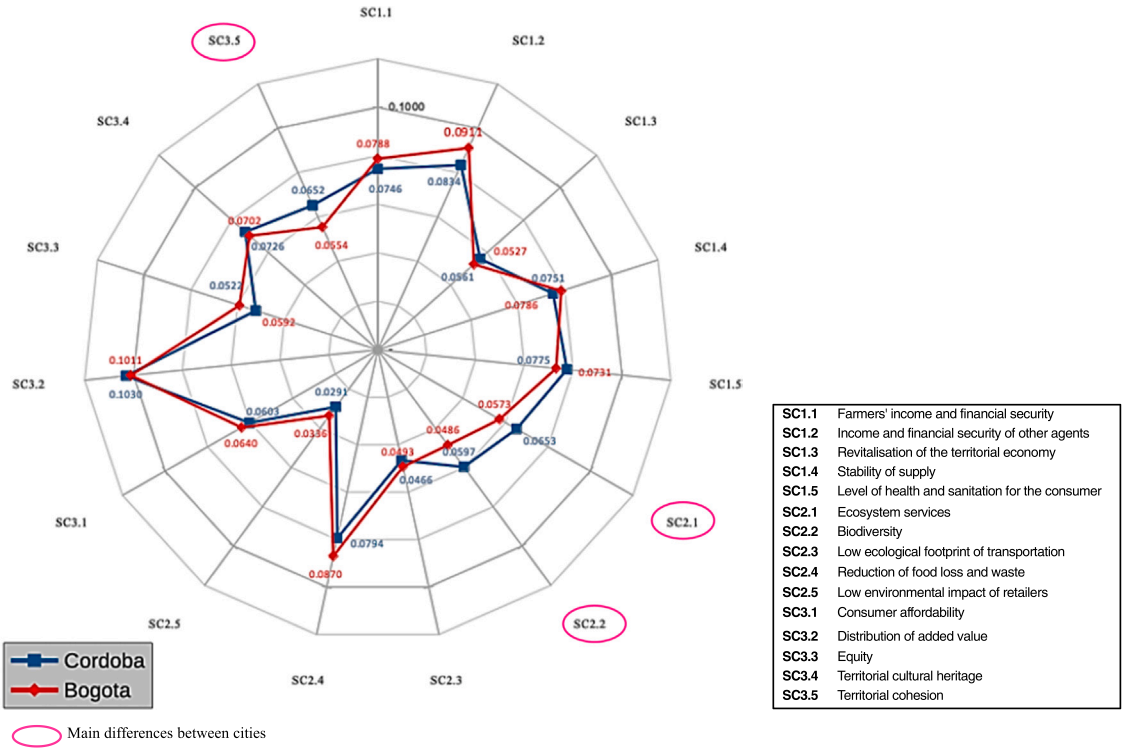


Fig. 2. Priorities of sub-criteria in Bogota and Cordoba.

biodiversity and SC3.5 territorial cohesion as they are better valued in Cordoba.

In both cities, the order of priorities or weights of the three major criteria is the same: first the economic ones, followed by the social ones, and finally the environmental ones. There are no major differences in the values of each criterion (Fig. 3).

Finally, with regard to interest groups, at the sub-criteria level greater disparities can be seen in the assessments between the different interest groups, although some trends remain in the overall results (Annex III.a). At the criteria level cities have a similar prioritisation in both cities; despite the market agents in Bogota turn out to be a particular interest group by making very different prioritisations compared to the other interest groups in the same territory or to their counterparts in Cordoba, and they give greater importance to the economic criteria (Annex III.b).

3.2. Assessment of the sustainability of food chain alternatives

3.2.1. Assessment of sustainability at sub-criteria level

The results show that the TSFSCs, to which the alternatives A3 'TSFSC - with a local retailer' and A4 'TSFSC - direct selling', are better valued in almost all the sustainability sub-criteria in both cities (Fig. 4). Fig. 4 highlights that the two cities agree that the greatest contribution of the TSFSC to sustainability is related to the keep of natural resources, specifically *SC2.1 ecosystem services* and *SC2.2 biodiversity as* well as territorial capital, where *SC3.3 equity, SC3.5 territorial cohesion*, and SC3.*4 territorial cultural heritage* are found. This last sub-criterion is specifically valued in A4 (TSFSC - direct selling). Finally, it is interesting to note how A2 in some criteria is a more sustainable option than A4 (Fig. 4b). The sub-criteria in which it stands out are *level of health and sanitation for the consumer* (SC1.5), *consumer affordability (*SC3.1), *reduction of food loss (*SC2.4) and l*ow environmental impact of retailers (SC2.*5). A possible explanation for this assessment could be the proximity of Cordoba to the province of Almeria, which is eminently agricultural, with an important production of greenhouse fruits and vegetables, allowing constant production throughout the year. Almeria is considered to be the agricultural pantry of Spain and Europe.

	Bogota	Cordoba
C1. Economic criteria	0.3742	0.3668
C2. Environmental criteria	0.2758	0.2800
C3. Social criteria	0.3500	0.3532

Fig. 3. Priorities of criteria in Bogota and Cordoba.

3.2.2. Assessment of sustainability at criteria level

The assessment of the alternatives by sustainability criteria (Fig. 5) indicates that both cities, in the most generally sustainable alternatives (A4 in Bogota and A3 in Cordoba), give more value to the performance of these alternatives in the environmental criterion (*C2),* followed by the social criterion (*C3),* and in third place the economic criterion (*C1*).

The two cities have rated A1 and A2 in last place according to their performance on sustainability criteria. It should be noted here that, for the experts consulted in the two cities, the best performance of these alternatives is in the economic criterion (*C1), and the* worst mostly in the social criterion (*C3*). In the opposite direction, A3 and A4 stand out for their performance on the social criterion (*C3), and the worst performance is the economic criterion (*C1) in Cordoba, and also the environmental criterion (C2) in Bogota.

3.2.3. Global assessment of sustainability of food chain alternatives

Fig. 6 shows that Bogota and Cordoba prioritise the TSFSCs (A3 and A4) as the most sustainable forms of food chain. However, within the TSFSC forms, Bogota considers the A4 (TSFSC - direct sale) as the farmers' markets, while for Cordoba it is A3 (TSFSC - with a local retailer) as the specialized shops.

The sustainability of A1 (LSFD – imported food) in the two cities is in the last place of the alternatives and has almost the same rating. The sustainability of A2 (LSFD – national food) is in third place of priority but has a higher rating in the case of Cordoba. The sustainability of A3 (TSFSC – with a local retailer), is the highest for Cordoba and the second

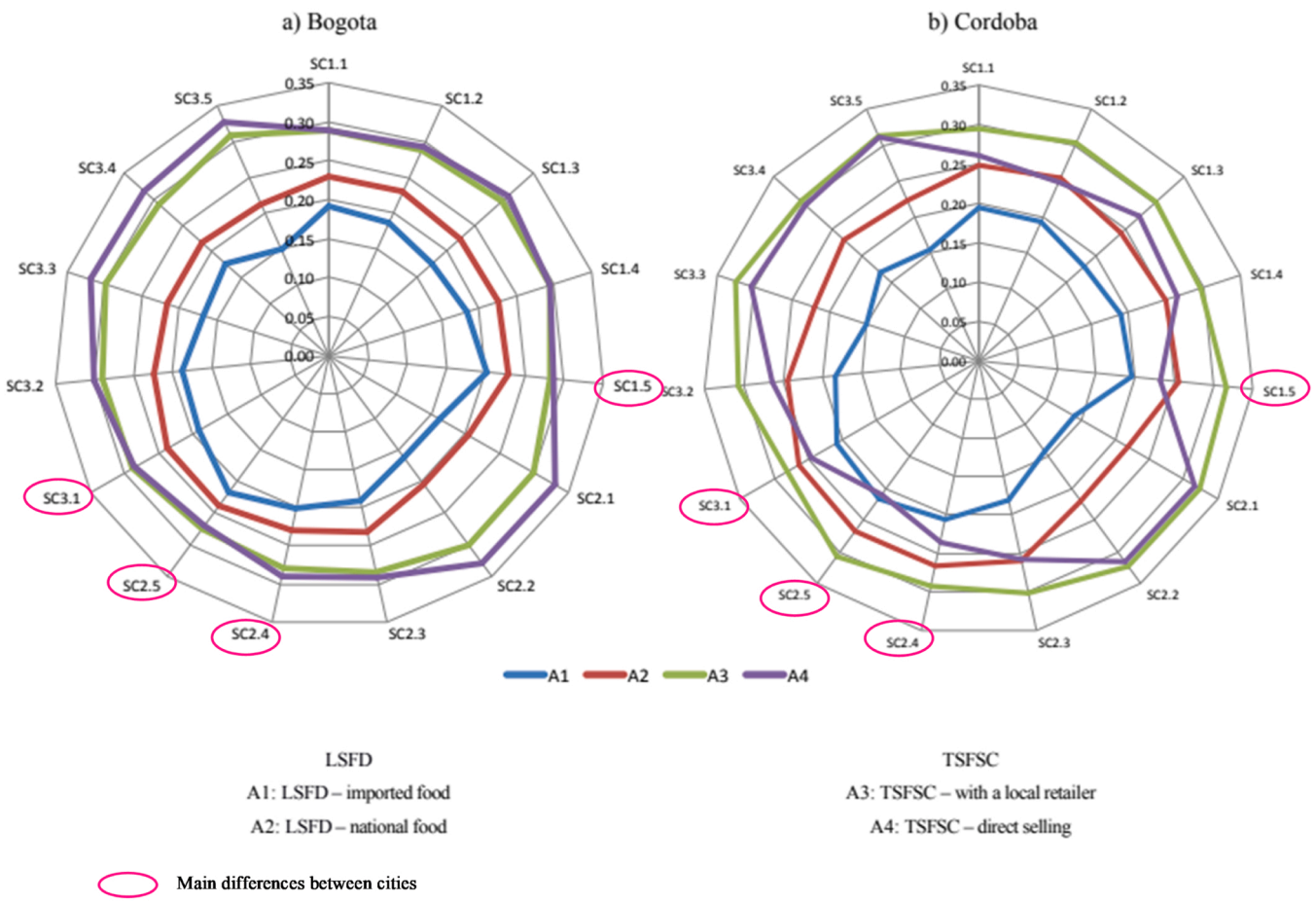


Fig. 4. Priorities of alternatives in the sustainability sub-criteria.

	Bogota			Cordoba		
	C1. Economic	C2. Environmental	C3. Social	C1. Economic	C2. Environmental	C3. Social
A1 LFD - imported food	0.1859	0.1853	0.1773	0.1870	0.1715	0.1752
A2 LFD - national food	0.2261	0.2225	0.2221	0.2478	0.2407	0.2385
A3 TSFSC - with a local retail	0.2909	0.2892	0.2937	0.3036	0.3108	0.3060
A4 TSFSC - direct selling	0.2971	0.3030	0.3069	0.2616	0.2771	0.2804

Fig. 5. Priorities of the alternatives in the sustainability criteria.

	Bogota	Cordoba
A1 LSFD - imported food	0.1829	0.1831
A2 LSFD - national food	0.2236	0.2372
A3 TSFSC - with a local retailer	0.2913	0.3066
A4 TSFSC - direct selling	0.3023	0.2731

Fig. 6. Global sustainability of alternatives in Bogota and Cordoba.

highest for Bogota. However, it is interesting to note that the difference in value between the two cities is very small (0.0153). The sustainability of A4 (TSFSC – direct selling) turns out to be the highest for Bogota and the second highest for Cordoba. However, it should be noted that: 1) the difference between the two cities is the widest among all the alternatives (0.0292), and 2) the difference in valuation between A3 (TSFSC – with a local retailer) and A4 (TSFSC – direct selling) for Bogota is very small (0.0110) when compared to the difference between these two alternatives for Cordoba, which triples (0.03353), which could indicate a remarkable preference in Cordoba for A3 (TSFSC – with a local retailer). Finally, the results by stakeholder highlight a similar trend to the overall average, despite civil society groups in Bogota and the market in Cordoba differing in prioritisation (Annex IV).

4. Discussion

4.1. Sustainability of supply chain: similarities in Bogota and Cordoba

4.1.1. TSFSCs are more sustainable in relation to the LSFD

The analysis carried out has identified that the two types of TSFSCs are more sustainable in relation to the LSFD. This assessment agrees with that made by Schmitta et al. (2017) who evaluated the sustainability of global and local food products in Europe and observed that chains oriented to the global market are always in the last position of the ranking, and that the top of the ranking is always occupied by local products (with only one intermediary or in direct sale).

4.1.2. Prioritised TSFSCs are more sustainable in ecosystem services, biodiversity, territorial cohesion

4.1.2.1. Ecosystem services (SC2.1) and biodiversity (SC2.2). TSFSCs evidence environmentally friendly production practices, in Bogota,

linked to peasant and agro-ecological production, and in Cordoba, linked to ecological and agro-ecological production. These practices promote crop diversification and rational use of water sources, which favours the maintenance of soil cover, agrobiodiversity, and low dependence on external inputs, such as fertilisers and pest and disease control products obtained on the farm (Parrado and Molina, 2014; Sevilla et al., 2012). In addition, diversified traditional production systems are less vulnerable to climate change than mixed or monoculture systems (Nicholls et al., 2015). On the other hand, many of the organisations linked to SFSC promote other ecosystem services such as landscaping through tourism and educational activities. Reina-Usuga et al. (2022) highlight that some initiatives that act as a link in the SFSC network promote educational activities for schools, as well as rural tours and rural.

4.1.2.2. Territorial cohesion (SC3.5). one of the aspects of the SFSCs is that they promote the creation and strengthening of the social cohesion of the territory, and especially the creation of networks that transcend commercial transactions to advocate for social issues linked to the food system and many of them to social justice in general (Reina-Usuga et al., 2020, 2018). In Bogota, local organisations have developed the capacity to aggregate supply (logistics) and influence the definition of local policies (territorial governance), manage support from municipal mayors' offices, articulate with peasant organisations from other municipalities to hold regional events and with other institutional actors (Parrado and Molina, 2014; Reina-Usuga et al., 2020). In Cordoba, the experiences maintain a high social density with those involved in different social and protest activities. In addition, the implementation of the local food policy aligned with the Milan Pact has enabled the creation of a coordination table in Cordoba, in which most of the initiatives linked to SFSC converge, which has allowed the design of participatory programmes and projects for the promotion of local, ecological and socially fair production and consumption (Reina-Usuga et al., 2022). Finally, it is interesting to highlight how SFSC initiatives are involved in social movements that go beyond the interest in agriculture and food marketing (Sevilla et al., 2012), and are guided by the articulation with collectives and organisations that propose actions around the transformation of the food system, rural development models, family farming, preservation of natural resources, climate change, among others (Reina-Usuga et al., 2022, 2018).

4.1.3. Prioritised TSFSCs are less sustainable in consumer affordability and farmer's income

4.1.3.1. Consumer affordability (SC3.1). The experts from Bogotá and Córdoba point to high prices and low affordability as the least sustainable in TSFSCs. In terms of price, they indicate that sometimes the price is higher in TSFSCs compared to LSFDs. This premise usually refers to agro-ecological products in Bogotá and organic products in Córdoba. This becomes a constraint for middle and low-income consumers to access TSFSCs. In terms of affordability, i.e. the physical acquisition of food, the poor performance of the TSFSCs in aspects such as the ease of access to marketing points, as well as the days and hours of access, stand out. This results in consumers not being able to access TSFSCs immediately, having to adjust to the characteristics of each initiative or buying at the LSFDs.

4.1.3.2. Farmers' income and financial security (SC1.1). Although the income of producers improves significantly when they join the TSFSCs, explained by the reduction of commercial intermediation and the increase of commercial skills by producers in these chains (Parrado and Molina, 2014), this increase presents a high fluctuation, which generates instability in the income of producers (Parrado and Molina, 2014; Sevilla et al., 2012). Some of the influencing factors are related to the percentage of production that farmers manage to sell through the TSFSCs, which is not always 100 % and therefore they must resort to traditional chains. As well as local support (city council) for farmers' market issues, stability of demand, seasonality in the case of Córdoba; and availability of transport in Bogotá, and weather eventualities (dry season, rain, and effects of climate change).

4.2. Sustainability of supply chain: Differences in Bogota and Cordoba

4.2.1. Directed selling in Bogota, and with a local retailer in Cordoba

Although both cities prioritise SFSCs, there is an important difference in the specific alternative. Bogotá identified SFSCs – directed selling while Córdoba SFSCs – with a local retailer. This could be explained by the fact that in Bogotá there is a predominant presence of peasant economy, characterised by small producers whose priority is to have a direct relationship with consumers, thus favouring farmers' markets from both peasant organisations and public policy (Novoa Álvarez et al., 2021; Reina-Usuga et al., 2018). In Cordoba, TSFSCs were born from the hand of small local commerce specialised in ecological products or collective consumption, such as the FACPE (Andalusian Federation of Consumers and Ecological Producers) (Reina-Usuga et al., 2018; Sevilla et al., 2012), and public policy prioritises logistic hubs and collective supermarket networks (Reina-Usuga et al., 2022; Vara-sánchez et al., 2021).

4.2.2. TSFSCs more sustainable in social equity for different reasons in each city

Social equity (SC3.3) has high performance in both cities, but their high priority may be related to territorial factors, as Colombia targets women, while Spain targets youth. In Bogotá, the importance of women for the development of initiatives linked to producers' markets (Villarreal, 2011; Zarama, 2015) has been evidenced, as well as an important line of public policies that facilitate their participation in TSFSCs (for example, law 731 of 2002 known as the Rural Women's Law, or law 1448 of 2011 on attention, assistance, and comprehensive reparation for victims of the armed conflict). On the other hand, in Spain, the participation of young farmers in TSFSCs has been evidenced, and there are public policies aimed mainly at promoting the participation of young people as a strategy to mitigate rural depopulation (second pillar of the CAP 2014–2020), as well as generational renewal and the introduction of innovations in agricultural activity (such as TSFSCs) (Sánchez-Zamora et al., 2017).

4.2.3. TSFSC - Directed selling in Bogota is more sustainable in territorial cultural heritage

4.2.3.1. Territorial cultural heritage (SC3.4). The TSFSCs in Bogota have encouraged the exchange of native seeds between producers in different territories, and the recovery of native seeds of bean, potato and maize varieties has been carried out. In cases where there is processing (such as bread), this is done in an artisanal way, which confers special characteristics to the product, the main characteristic in the purchasing preference. Thus, the knowledge inherited or developed by the farmers themselves is one of their main assets (Parrado and Molina, 2014); and farmers' markets are highlighted as a scenario for the exchange of seeds and knowledge between farmers and consumers.

4.3. TSFSC -with a with a local retailer in Cordoba is more sustainable in Level of health and sanitation for the consumer

4.3.1. Level of health and sanitation for the consumer (SC1.5)

The interviewees argue that the European Union has established regulations on sanitary and phytosanitary requirements for food production and distribution, such as Regulation (EC) No 178/2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in

matters of food safety. These regulations are stricter and more controlled than those existing in Colombia.

4.4. From sustainability to resilience in food supply chain

It is important highlight that food systems can be sustainable or not, depending on the particular practices that the agents involved implement (Born and Purcell, 2006), both at a productive-commercial level and at a socio-political level. Thus, criteria such as territorial identity, know-how and participatory governance mechanisms become relevant to improve the sustainability of food chains (Schmitta et al., 2017).

In this context, Van der Ploeg et al. (2010) point out that one of the main contributions that can be made to rural development is to promote the control of agri-food chains to be much more in the hands of small farmers than in those of large chains. This generates different forms of governance, in the sense that the autonomy of farmers, in terms of food production, processing and marketing, strengthens their capacity for resilience, generates common resources and, consequently, increases the possibilities for social and economic reproduction, in their specific context. The intrinsic characteristics of the TSFSCs make them potential vehicles for tackling some of the shortcomings in the governance of the current food system, for example, by favouring territorial cohesion (SC3.5) (Reina-Usuga et al., 2018) and promoting processes of power distribution between the different food agents in the territory (SC3.2). These elements are fundamental in the sustainability of a food chain. Therefore, the participatory governance processes (reflexive and networked) that take place within the TSFSCs are a precondition for achieving more sustainable food systems (Reina-Usuga et al., 2020). Finally, the interruption of food systems from the current crisis caused by COVID-19 highlights the need to reconnect production and consumption at the local level, based not only on sustainability criteria, but also on dynamic resilience criteria such as the multifunctionality of the territory (Sánchez-Zamora et al., 2017; Sellberg et al., 2020), diversity (Kummu et al., 2020), collective learning and social capital (Sellberg et al., 2020), the promotion of polycentric governance systems (Li et al., 2020) and multilevel coordination (Torres-Salcido and Sanz-Cañada, 2018). Planning for sustainable and resilient food systems will help to ensure that: (i) the food supply chain is diversified and adapted to future shocks; (ii) access to food is maintained at or rapidly returns to pre-disaster levels; and (iii) the impact on vulnerable actors in food systems, including small producers, small traders and low-income and marginalized groups, is mitigated (FAO-RUAF, 2020). Thus, strengthening TSFSCs through public policy and urban planning can contribute to the consolidation of sustainable and resilient food systems.

5. Conclusions

The comparison between different food chain alternatives, i.e. TSFSCs and LSFD, in the cities of Bogota and Cordoba, shows that TSFSCs are more sustainable in all the sub-criteria evaluated and, therefore, are the most sustainable option for food production and distribution. In this way, they represent a valuable alternative to globalised food distribution systems, whose fragility is being highlighted by the ongoing Russia-Ukraine conflict. It highlights their contribution to ecosystem services, equity and territorial cohesion. However, there is a need to improve their affordability for low- and middle-income consumers and the income of farmers. On the other hand, the high priority given by the experts of the two cities to the social sub-criteria of value-added distribution to assess the sustainability of agri-food channels is highlighted. This sub-criterion is related to a decentralization of power in food networks, which promotes the empowerment of all actors involved, and leads to the strengthening of the territory's social capital and the configuration of governance processes in food systems. As for the forms of TSFSCs, Bogota prioritizes direct sales and Cordoba the channel with an intermediary. The prioritization by groups of experts maintains the total trend. However, the market experts in Cordoba consider the LSFD form with national product as the second most sustainable alternative, which could be related to the economies of scale that exist in the Andalusian agri-food sector.

In the evaluation of the sustainability of food chain alternatives, ANP is postulated as a potentially valuable methodology due to its flexibility and possibility of capturing the views of different groups, and the inclusion of multiple criteria and alternatives. The results obtained in this research cannot be generalized beyond Bogota and Cordoba, but the proposed methodology and rationale can be extrapolated to the analysis of other cities. Future studies could carry out applications of the ANP model designed in other cities, which would make it possible to identify whether there are variations in the assessment of the criteria and sub-criteria of sustainability that may be related to the territorial dimension. Also, new sub-criteria of sustainability could be investigated such as the development and use of ICT, a factor that can be linked to product specifications (i.e. fresh products with high added value) and type of consumer (i.e. purchasing power).

Data Availability

No data was used for the research described in the article.

Acknowledgements

Funding for open access charge: Universidad de Málaga / CBUA.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.landusepol.2022.106529.

References

Adrianto, L., Matsuda, Y., Sakuma, Y., 2005. Assessing local sustainability of fisheries system: a multi-criteria participatory approach with the case of Yoron Island, Kagoshima prefecture, Japan. Mar. Policy.

Blay-Palmer, A., Conaré, D., Meter, K., Battista, A., di, Johnson, C., 2020. Sustainable Food Systems. Assessment: Lessons from global practice. Routledge,.

Born, B., Purcell, M., 2006. Avoiding the local trap: Scale and food systems in planning research. J. Plan. Educ. Res.

Bottomley, P.A., Doyle, J.R., 2001. A comparison of three weight elicitation methods: good, better, and best. Omega 29, 553–560.

Brunori, G., Galli, F., 2016. Sustainability of local and global food chains: introduction to the special issue sustainability of local and global food chains: introduction to the special issue. Sustainability 8.

Carmona-Torres, C., Parra-López, C., Hinojosa-Rodríguez, A., Sayadi, S., 2014. Farm-level multifunctionality associated with farming techniques in olive growing: An integrated modeling approach. Agric. Syst.

Carvalho, A.M., de, Verly, E., Marchioni, D.M., Jones, A.D., 2021. Measuring sustainable food systems in Brazil: a framework and multidimensional index to evaluate socioeconomic, nutritional, and environmental aspects. World Dev. 143, 105470 https://doi.org/10.1016/j.worlddev.2021.105470.

Cid, B., 2007. Para. Una Econ. política De. la comida: Una revisión teórica. Soc. Hoy 13, 73–82.

DANE, 2018. Resultados y proyecciones (2005–2020) censo 2005. Bogota.

DNP, 2015. El campo colombiano: un camino hacia el bienestar y la paz. Misión para la transformación del campo. Bogota.

El, Bilali, H., 2019. Research on agro-food sustainability transitions: a systematic review of research themes and an analysis of research gaps. J. Clean. Prod. 221, 353–364.

Ericksen, P.J., 2008. Conceptualizing food systems for global environmental change research. Glob. Environ. Chang 18, 234–245.

Fabbrizzi, S., Menghini, S., Marinelli, N., 2014. The short food supply chain: a concrete example of sustainability. A literature review. Riv. di Stud. sulla Sostenibilita 18, 189–206. https://doi.org/10.3280/RISS2014-002012.

FAO, 2019. Review of The State of Food Security and Nutrition in the World 2019. Safeguarding against economic slowdowns and downturns. Rome.

FAO-RUAF, 2020. City Region Food Systems to cope with COVID-19 and other pandemic emergencies. Roma.

Feenstra, G.W., 1997. Local food systems and sustainable communities. Am. J. Altern. Agric. 12, 28–36.

Fonte, M., Cucco, I., 2017. Cooperatives and alternative food networks in Italy. The long road towards a social economy in agriculture. J. Rural Stud. 53, 291–302.

Forman, E., Peniwati, K., 1998. Aggregating individual judgments and priorities with the analytic hierarchy process. Eur. J. Oper. Res.

Forssell, S., Lankoski, L., 2014. The sustainability promise of alternative food networks: an examination through "alternative" characteristics. Agric. Hum. Values 32, 63–75.

Galindo, G., 2015. Hábitos de consumo de frutas y hortalizas en personas de 15 a 39 años, habitantes de Bogota. Universidad Nacional de Colombia.
Gallar, D., Vara, I., 2017. Alimentado Cordoba. Diagnóstico del sistema alimentario local y proceso (más allá) del Pacto de Milán. Cordoba.
Galli, F., Brunori, G., 2013. Short Food Supply Chains as drivers of sustainable development. Evidence Document, Evidence Document.
Galli, F., Bartolini, F., Brunori, G., 2016. Handling diversity of visions and priorities in food chain sustainability assessment. Sustainability 8.
Gasparatos, A., 2010. Embedded value systems in sustainability assessment tools and their implications. J. Environ. Manag. 91, 1613–1622.
Gava, O., Brunori, G., Bartolini, F., Galli, F., 2014. Sustainability of local versus global bread supply chains: a literature review, in: 3rd AIEAA Conference "Feeding the Planet and Greening Agriculture: Challenges and Opportunities for the Bio-Economy." pp. 1–19.
González, I., Haro, De, Ramos, T., Renting, H, E., 2012. Circuitos Cortos De. Comer. En. Andal.: Un. análisis Explor. Rev. Esp. Estud. Agrosoc. Y. Pesq. 232, 193–227.
Goodman, D., DuPuis, E.M., Goodman, M.K., 2012. Alternative food networks: Knowledge, practice, and politics, Alternative Food Networks: Knowledge, Practice, and Politics.
Gutiérrez, O., 2016. Políticas para mejorar la participación de pequeños productores en la comercialización de alimentos en Colombia. Universidad Nacional de Colombia.
Hebinck, A., Zurek, M., Achterbosch, T., Forkman, B., Kuijsten, A., Kuiper, M., Nørrung, B., Veer, P. van 't, Leip, A., 2021. A Sustainability Compass for policy navigation to sustainable food systems. Glob. Food Sec. 29, 100546. https://doi.org/10.1016/j.gfs.2021.100546.
Ilbery, B., Maye, D., Kneafsey, M., Jenkins, T., Walkley, C., 2004. Forecasting food supply chain developments in lagging rural regions: Evidence from the UK. J. Rural Stud. 20, 331–344.
IPCC, 2019. Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems. In press.
IPES-Food, 2017. Too big to fail?, Too big to feed: Exploring the impacts of mega-mergers, concentration, concentration of power in the agri-food sector.
Junta de Andalucía, 2020. El Sector Agrario y Pesquero en Andalucía.
Kirwan, J., Lang, T., Brunori, G., Galli, F., Barjolle, D., Broekhuizen, R.Van, 2016. Are local food chains more sustainable than global food chains ? considerations for assessment are local food chains more sustainable than global food chains ? considerations for assessment. Sustainability 8.
Kummu, M., Kinnunen, P., Lehikoinen, E., Porkka, M., Queiroz, C., Röös, E., Troell, M., Weil, C., 2020. Interplay of trade and food system resilience: Gains on supply diversity over time at the cost of trade independency. Glob. Food Sec. 24, 100360.
Lamine, C., Garçon, L., Brunori, G., 2019. Territorial agrifood systems: a Franco-Italian contribution to the debates over alternative food networks in rural areas. J. Rural Stud. 68, 159–170. https://doi.org/10.1016/j.jrurstud.2018.11.007.
Li, T., Dong, Y., Liu, Z., 2020. A review of social-ecological system resilience: mechanism, assessment and management. Sci. Total Environ. 723, 138113.
Liu, P., Zhao, Y., Ravenscroft, N., Harder, M.K., 2020. Responsibility-driven collective action in the context of rapid rural depopulation. J. Rural Stud. 75, 48–56.
MAPAMA, 2015. Caracterización de la comercialización y distribución de productos ecológicos a través de los canales de venta especializados. Madrid.
Marsden, T., 2017. Agri-Food and Rural Development; Sustainable place making. Bloomsbury, London.
Marsden, T., Morley, A., 2014. Sustainable Food Systems, Sustainable Food Systems: Building a New Paradigm. Roudlegde.
Martinez-Alier, J., Munda, G., O'Neill, J., 1998. Weak comparability of values as a foundation for ecological economics. Ecol. Econ. 26, 277–286.
Massot, A., 2016. Análisis para la Comisión AGRI- La agricultura en Andalucía.
Michel-Villarreal, R., Hingley, M., Canavari, M., Bregoli, I., 2019. Sustainability in alternative food networks: a systematic literature review. Sustain 11.
Moragues-Faus, A., Sonnino, R., Marsden, T., 2017. Exploring European food system vulnerabilities: towards integrated food security governance. Environ. Sci. Policy 75, 184–215.
Nchanji, E.B., Lutomia, C.K., 2021. COVID-19 Challenges to sustainable food production and consumption: future lessons for food systems in Eastern and Southern Africa from a gender lens. Sustain. Prod. Consum. https://doi.org/10.1016/j.spc.2021.05.016.
Ness, B., Urbel-Piirsalu, E., Anderberg, S., Olsson, L., 2007. Categorising tools for sustainability assessment. Ecol. Econ. 60, 498–508.
Nicholls, C., Henao, A., Altieri, M.A., 2015. Agroecología y el diseño de sistemas agrícolas resilientes al cambio climático. Agroecología 10, 7–31.
Niemira, M.P., Saaty, T.L., 2004. An analytic network process model for financial-crisis forecasting. Int. J. Forecast. 20, 573–587.
Novoa Álvarez, J., Camacho, L.C., Aranda Camacho, Y., Acevedo-Osorio, Á., Velasquez, M.X., 2021. Gobernanza para la transición agroecológica y el acceso a mercados: caso del territorio de Sumapaz, in: Aranda Camacho, Y., Molina-Ochoa, J.P. (Eds.), Redes y Circuitos Cortos de Comercialización Agroalimentarios. Bogotá. 117–139.
Parrado, A., Molina, J.P., 2014. Mercados campesinos: modelo de acceso a mercados y seguridad alimentaria en la región central de Colombia. Bogota.
Parra-López, C., Groot, J.C.J., Carmona-Torres, C., Rossing, W.A.H., 2008. Integrating public demands into model-based design for multifunctional agriculture: An application to intensive Dutch dairy landscapes. Ecol. Econ. 67, 538–551.
Reina-Usuga, L., De-Haro, T., Parra-López, C., 2018. Canales cortos de comercialización territorial: conceptualización, caracterización y aplicación para el caso de Cordoba, España. ITEA 114, 183–202.
Reina-Usuga, L., de Haro-Giménez, T., Parra-López, C., 2020. Food governance in territorial short food supply chains: different narratives and strategies from Colombia and Spain. J. Rural Stud. 75, 237–247.
Reina-Usuga, L., Parra-López, C., de Haro-Giménez, T., 2022. Urban food policies and their influence on the development of Territorial Short Food Supply Chains: The case of cities in Colombia and Spain. Land Use Policy 112, 105825. https://doi.org/10.1016/j.landusepol.2021.105825.
Renting, H., Marsden, T.K., Banks, J., 2003. Understanding alternative food networks: exploring the role of short food supply chains in rural development. Environ. Plan. A 35, 393–411. https://doi.org/10.1068/a3510.
Renting, H., Schermer, M., Rossi, A., 2012. Building food democracy: exploring civic food networks and newly emerging forms of food citizenship. Int. J. Sociol. Agric. Food 19, 289–307.
Rivera, M., Guarín, A., Pinto-Correia, T., Almaas, H., Mur, L.A., Burns, V., Czekaj, M., Ellis, R., Galli, F., Grivins, M., Hernández, P., Karanikolas, P., Prosperi, P., Sánchez Zamora, P., 2020. Assessing the role of small farms in regional food systems in Europe: evidence from a comparative study. Glob. Food Sec 26. https://doi.org/10.1016/j.gfs.2020.100417.
Saaty, T.L., 2001. The Analytic Network Process: Decision Making with Dependence and Feedback. RWS Publications, Pittsburgh (USA).
Saaty, T.L., Takizawa, M., 1986. Dependence and independence: from linear hierarchies to nonlinear networks. Eur. J. Oper. Res. 26, 229–237.
SAFA, 2013. Sustainability Assessment of Food and Agricultural System: Indicators. Food and Agriculture Organization of the United Nations,, Rome, p. 2013.
Sala, S., Ciuffo, B., Nijkamp, P., 2015. A systemic framework for sustainability assessment. Ecol. Econ. 119, 314–325.
Sánchez-Zamora, P., Gallardo-Cobos, R., Ceña-Delgado, F., 2017. Análisis de los factores de resiliencia en territorios rurales de Andalucía mediante técnicas de Proceso Analítico en Red (ANP). ITEA 113, 68–89.
Schader, C., Grenz, J., Meier, M.S., Stolze, M., 2014. Scope and precision of sustainability assessment approaches to food systems. Ecol. Soc. 19.
Schmitta, E., Galli, F., Menozzi, D., Maye, D., Touzard, J.M., Marescotti, A., Six, J., Brunori, G., 2017. Comparing the sustainability of local and global food products in Europe. J. Clean. Prod. 165, 346–359. https://doi.org/10.1016/j.jclepro.2017.07.039.
Schneider, S., Salvate, N., Cassol, A., 2016. Nested markets, food networks, and new pathways for rural development in Brazil. Agriculture 6, 61.
Sellberg, M.M., Norström, A.V., Peterson, G.D., Gordon, L.J., 2020. Using local initiatives to envision sustainable and resilient food systems in the Stockholm city-region. Glob. Food Sec 24, 100334.
Sevilla, E., Soler, M., Gallar, D., Vara, I., Calle, Á., 2012. Canales cortos de comercialización alimentaria en Andalucía. Centro de Estudios Andaluces, Sevilla.
Slätmo, E., Fischer, K., Röös, E., 2017. The framing of sustainability in sustainability assessment frameworks for agriculture. Sociol. Rural. 57, 378–395.
Sonnino, R., 2016. The new geography of food security: Exploring the potential of urban food strategies. Geogr. J. 182, 190–200.
Torres-Salcido, G., Sanz-Cañada, J., 2018. Territorial governance. A comparative research of local agro-food systems in Mexico. Agriculture 8, 18.
Trivette, S.A., 2019. The importance of food retailers: applying network analysis techniques to the study of local food systems. Agric. Hum. Values 36, 77–90. https://doi.org/10.1007/s10460-018-9885-1.
United Nations, 2015. Integrating the Three Dimensions of Sustainable Development: A Framework and Tools. New York.
Van der Ploeg, J.D., Jingzhong, Y., Schneider, S., 2010. Rural development reconsidered: building on comparative perspectives from China. Braz. Eur. Union. Riv. Di Econ. Agrar 65, 163–190.
Vara-sánchez, I., Gallar-Hernández, D., García-García, L., Morán Alonso, N., Moragues-Faus, A., 2021. The co-production of urban food policies: Exploring the emergence of new governance spaces in three Spanish cities. Food Policy 103. https://doi.org/10.1016/j.foodpol.2021.102120.
Villanueva Rodríguez, A.J., Gómez-Limón Rodriguez, J.A., Arriaza Blamón, M., 2014. Influencia de los factores de gestión en la producción de bienes públicos en el olivar de regadío. Rev. Esp. Estud. Agrosoc. Y. Pesq. 77–115.
Villarreal, N., 2011. Mujeres rurales y oportunidades económicas: de la participación al empoderamiento. Tend. Y. Retos 243–259.
World Commission on Environment and Development, 1987. Our Common Future. New York, NY, USA.
Zahm, F., Viaux, P., Vilain, L., Girardin, P., Mouchet, C., 2007. Farm Sustainability Assessment using the IDEA Method: from the concept of farm sustainability to case studies on French farms. Sustainable agriculture. from Common Principles to Common Practices. Proceedings from the International Forum on Assessing Sustainability in Agriculture (INFASA). March 16, 2006, Bern, CHE 14, 77–110.
Zarama Moreno, R.V., 2015. Participación de las mujeres en los mercados campesinos y populares: el caso de Paipa y Chocontá en la región central de Colombia. Universidad Nacional de Colombia.