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Article

Determination of the transition strategies to a sustainable and resilient city-region food system using the AHP-SWOT-TOWS methodology for Istanbul

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ABSTRACT

Access to healthy food is a topic that has been largely discussed in the literature for about 20–30 years. In many studies, it has been emphasised that the connections between the urban and rural areas should be continuous and strong. The Covid-19 pandemic has shed light on the importance of the issue of feeding the cities and has also revealed the problems in the way the existing system functions. Based on this, the aim of this article is to understand how the food system of Istanbul was affected by the Covid-19 global epidemic and also discuss what should be done to create a resilient and sustainable food system in cities. Within the scope of this research, a strength, weakness, opportunity, threat (SWOT) analysis was conducted to determine the factors affecting the resilience of the food system in Istanbul. Then, the SWOT criteria were weighted using the analytical hierarchy process (AHP) method. The weighted criteria were matched in a TOWS matrix, and strategies to increase the resilience of the food system in Istanbul against shocks and risks were developed. The analysis is based on interviews conducted with industry experts and actors. As a result, it is observed that the long supply chain is dominant in Istanbul and there is a need to strengthen the direct and spatial relations between the producer and consumer. Therefore, it is vital to address the food system while considering the spatial dimension, to strengthen the link between urban and rural areas, to increase the resilience of the food system against shocks as well as to ensure the accessibility of food products within shorter distances.

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INTRODUCTION

The Covid-19 pandemic has shown that access to food in cities is an important and alarming issue. Therefore, there is a need to reconsider the structure and features of the food system. Cities are fed by complex logistic networks which expand and lengthen the food supply chains spatially (Murdoch et al., 2000; Reardon & Timmer, 2007). In other words, the different stages in the food chain such as production, processing, distribution, and consumption spread over wide geographies. This also means that disruptions at any stage of the food system or congestions

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in the flow of the food system affect the whole system. In short, the Covid-19 pandemic has shown that the continuity of the food system and the access to remote resources can be disrupted and therefore, there is a need to find solutions to increase the self-feeding capacity of cities.

In the last 30 years, the negative impacts of long food chains in related literature have been explored. These negative impacts are explained in terms of the economic, social, and environmental aspects. Eventually, alternative solutions that connect the consumer in the city directly with the producer in rural areas and their potential to strengthen local economies and social connections are pointed out (Kloppenburg et al., 1996). So, the delocalisation of the food system is important to strengthen local food systems and also reduce dependence on remote food sources. Issues such as the climate change, the 2007–2008 food crisis, and the increase in food-related diseases have shown the importance of physical and relational connectivity between both the producer and the consumer, and this has led to the development of approaches to strengthen the urban-rural relationship/between urban and rural areas. These approaches are namely; the short food chains (Marsden et al., 2000), alternative food networks (Renting et al., 2003), local food systems, and city region food systems (Dubbeling et al., 2017). All of these emphasise a common point, which is to re-establish the relationship between the producer and the consumer. Thus, it is assumed that the small-scale producer will be economically stronger, and the consumer will have reliable access to local and healthy food with known origins. Renting et al. (2003) and Darolt et al. (2016) particularly emphasised the importance of the participation of small-scale producers who cannot compete with large-scale enterprises and eventually, excluded from the conventional food chain in local food systems in terms of the resilience. From this perspective, new initiatives such as community-supported agriculture, farmers' markets, sustainable farming, and consumer cooperatives have emerged. The Covid-19 pandemic has led to the development of regional approaches that connect the producer and the consumer directly as well as the need to increase the self-feeding capacity of cities has become a priority in many cities.

Today, a significant part of the world's population lives in cities. While around only 30% of the world's population lived in cities in the 1950s, this percentage increased to 56% in 2020. According to a report by the United Nations Department of Economic and Social Affairs (DESA), the migration from rural areas will keep on increasing in the future, and the rate of urbanisation will be 68% in 2050. The report also states that in Turkey, the urban population will increase from 75% to 86% between 2018 and 2050. It is also predicted that the number of megacities with a population of over 10 million will increase from 31 to 40 by 2030 (United Nations, 2018). The figures provided indicate that while the rural areas will lose their population and become emptier and emptier, the cities will become even more crowded. However, the problem is not limited to the issue of overcrowding of cities. Along with that, cities that are dependent on external sources for food and bear a significant part of the population will face arising problems related to food security and the sustainability of natural resources. The pandemic has taught important lessons about the possible risks that cities may encounter in the future and preparations must be made accordingly. One of them is the necessity to rethink the food systems for cities in the context of food security and accessibility to healthy food.

The resilience of urban food systems is defined as the ability to cope with risks and uncertainties and adapt to the process of change (Folke, 2016). The resilience of a food system breaks down into various components (Anderies et al., 2004). Studies particularly highlight the importance of some factors. These factors are the diversity in food resources (local and regional as well as global) and also the scale at which food is produced and distributed for building the resilience of food systems (Canal Vieira et al., 2018). Therefore, to understand the resilience of the food system, it is important to identify the strengths and weaknesses of the system and to define the leverage points and interventions to increase the resilience of the food system.

This article aims to understand how the food system in Istanbul has been affected by the COVID-19 pandemic. In this context, two research questions were determined. First is what are the problematic areas and strengths of Istanbul's food systems during the COVID-19 pandemic. The second one is what can do to make the food system of Istanbul resilient and prepare it against risks and uncertainties. The reason for choosing Istanbul is that it holds approximately 19% of Turkey's population and it is a metropolis dependent on external sources in terms of food supply. Therefore, it is more likely to be affected by shocks and risks than any other region in the country.

The article has six sections. After the introduction, the city-food relationship in risky environments is discussed, and innovative solutions and research are done through literature reviews in the process of establishing resilient food systems. In the third section, the question "Who feeds Istanbul?" is addressed and along with the question, Istanbul's current food system and relations are analysed. In the fourth section, the method of the field study carried out to determine the factors affecting the resilience of Istanbul's food system in the context of the Covid-19 pandemic is explained. As for the fifth section, the findings obtained from the SWOT-Analytical Hierarchy Process (AHP)-TOWS analysis results are presented. In the conclusion, the different issues (in order of priority) to re-establish the city-food relations in Istanbul are underlined, and guiding tips are presented to policymakers.

TERRITORIAL APPROACHES FOR RESILIENCE AND SUSTAINABLE FOOD SYSTEMS

Food security is about everyone's equal access to healthy and quality food. The COVID-19 pandemic has directly and indirectly affected the food security of cities. Interruption of the food supply chain, curfews, rise in food prices, and decreasing household income have made the accessibility to food difficult for urban residents (Niles et al., 2020; Sukhwani et al., 2020). Food producers in rural areas could not deliver a significant part of the products they produced to urban consumers. Therefore, this situation triggered the rethinking of urban-rural relations and food systems.

The food system approach is the understanding of the complex relationships between the different components of the food system. In other words, it is about all the activities within the food supply chain related to the production, processing, packaging, distribution, retail sale, and consumption of food (Ericksen, 2008). The city region food system is defined as the network of actors, processes, and relationships related to food production, processing, marketing, and consumption in a specific geographical region. The term region, in this context, is defined as the city centre along with its surrounding urban periphery and rural areas. There are also other minor urban centres from which remote producers provide food products within the boundary of the region. This definition demonstrates the strong connections between the city and the countryside, the cooperation among the different local authorities, and last, the importance of relations that exist beyond administrative borders (Dubbeling et al., 2017).

Disruptions in the food system can arise from external and sudden natural, political, social, or economic shocks. Similarly, this is how the Covid-19 pandemic affected the whole world and also affected the food system. Studies regarding the food systems and the concept of resilience target finding ways to ensure uninterrupted food security and sustainable food systems (Naylor, 2009; Prosperi et al., 2014). De Schutter (2014) states that food insecurity is mainly a problem of availability, accessibility, affordability, and adequacy. Another key problem is the lack of equal access to food between or within cities. This is described by the concept of "food deserts" in the literature. This concept refers to the problem of unequal access to food in cities in industrialised economies and poor urban neighbourhoods where people are deprived of or have poor access to food (Pothukuchi & Kaufman, 2000). The resilience of food systems prioritises the provision of adequate, suitable, and accessible food for all. Other key terms are sufficiency, appropriate food, and accessibility. First, sufficiency stands for adequate quantity and nutritional quality of food. Second, suitable food refers to its cultural, technical, and nutritional suitability. Last, accessibility to food stands for the products being physically and economically within reach. These components represent the first three dimensions of food security which are availability, access, and use (FAO, 2008). These components need to continue functioning during times of crisis and this is why, the fourth dimension of food security is stability (Russo et al., 2008). Therefore, the food system can become resilient by approaching it holistically, that is, by understanding the complex interactions of components and their results (Pinstrup-Andersen & Watson, 2011).

The interest to develop a resilient food system cropped up following the 2007/2008 food crisis. After this crisis period, the concept of urban agriculture and the practice of agriculture in the urban periphery was added to the agenda of local governments and national policies in many developing countries (Blay-Palmer, 2018; Rocha & Lessa, 2009; Moragues-Faus & Battersby J., 2021). These efforts initially focused on improving food security and reducing poverty. With climate change acknowledged as an alarming urban problem in recent years, food systems have been approached to reduce urban heat islands and the urban ecological footprint to mitigate climate change (Carey & James, 2018). The rise in food-related health problems, along with public health concerns such as obesity and malnutrition in Europe and North America, as well as concerns regarding the ecological footprint of urban food systems have all led local governments to address food-related issues on the urban agenda.

The urban food systems are likely to face more frequent issues in the future. This is why, there is a need to increase the resilience of food systems such that they can withstand disruptions and recover while still maintaining food security for everyone (Carey & James, 2018). The Covid-19 pandemic paved way for the opportunity to increase the resilience of food systems and trigger the transformation of food systems. Eventually, in this period, efforts toward restructuring short food supply chains increased. For instance, producers have responded to curfews, the closing of markets, and social distancing rules by shifting their sales to online platforms (IPES-Food 2020, FAO 2020).

In this context, related literature reviews show that studies inspecting the impact of COVID-19 and guidelines for establishing resilient food systems have increased. While some of these studies have examined the subject in terms of less developed countries (Priyadarshini & Chirakkuzhyil Abhilash, 2021; Ekinci et al., 2021; Bene, 2020; Moseley & Battersby, 2020; Sukhwani et al., 2020; Amjath-Babu et al., 2020), others have focused on developed countries (Lever & Sonnino, 2022; Blay-Palmer et al., 2021; Bellamy et al., 2021; Dou et al., 2021). In these studies, the different actors who are effective in ensuring the continuity of food supply chains and food safety during the COVID-19 pandemic and their actions are emphasised. As a result, it was highlighted that the local government and non-

governmental organisations played an active role in this process, and it was observed that the issue related to the interruption in the long food supply chains was overcome with the support of local food systems. For instance, Abiral and Helicke (2020) compared the impact of the COVID-19 pandemic on long and short food supply chains in the US and Turkey. The study shows that the short food supply chains that directly connect the producer and the consumer are the most appropriate solution to increase the resilience of food systems while also rebuilding the trust between producer-consumer. Although such studies have increased in recent years, it is also emphasised that studies aiming to establish a relationship between the COVID-19 pandemic and local and regional food systems should be increased (Abiral & Helicke, 2020; Torero Cullen, 2020; Sukhwani et al., 2020). In the scope of this study, the aim is to contribute to the related literature by examining the impact of the COVID-19 pandemic on the food system and the potential to create a regional food system with a focus on Istanbul, which is the most populated city in Turkey.

WHO IS FEEDING ISTANBUL?

Approximately 19% of the population in Turkey lives in Istanbul. While this value was 4.5 million in 1980, it increased approximately by 4 times and reached 15,519,000 people in 2021. Due to the population pressure and urbanisation, the availability of agricultural land is decreasing. When the 1990-2018 land use data are compared and examined, it is noted that there is a 10% increase in artificially built areas and a 4% decrease in agricultural areas. Likewise, there was a 6% decrease in forest and semi-natural areas. This situation has led to a significant decrease in agricultural production activities in the periphery of the city in terms of agricultural production (Figure 1).

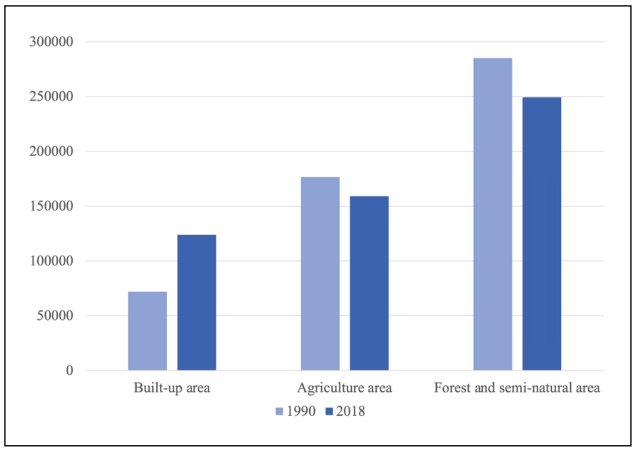

Figure 1. Land use in Istanbul (1990–2018) (Republic of Turkey, Ministry of Agriculture and Forestry, 2021).

Annually, around 7.5 million tons of fresh fruits and vegetables are supplied to Istanbul from outside the city (Yerküre Cooperative, 2021). This value is approximately 67 times the amount produced in Istanbul (112,092 tons) (TURKSTAT, 2020). Istanbul is a city surrounded by provinces that have a key position in terms of agricultural food production for Turkey. Most of the fresh food coming to Istanbul from outside is supplied from these provinces. When the agricultural production amounts of the provinces supplying food to Istanbul in 2020 are examined, it is found that a total of 2,252,596 tons of fruit and 6,900,872 tons of vegetables are produced in these regions (Table 1). Istanbul is also an important marketplace for production places outside its immediate surroundings. In the interviews made within the scope of this study, it was observed that fresh vegetables and fruits came from the Mediterranean region, products such as tea and hazelnuts were supplied from the Black Sea region, and grains were supplied from the Central Anatolia and Southeast regions, and as for meat and meat-related products, they were supplied from the East and Southeast Regions to Istanbul.

When the food supply chain which starts from producers in different places in Turkey to the consumers in Istanbul is examined, it is observed that there are two separate supply chains. These are referred to as the long and short supply chains, operate side by side, and are also sometimes intertwined (Figure 2). It has also been observed that there are intermediaries between the producers and the consumers in the long food supply chain. There are two fruit and vegetable wholesale markets in Istanbul: Bayrampaşa and Ataşehir wholesale market. Fresh vegetables and fruits are transported daily from various provinces of Turkey, especially Antalya, Mersin, and provinces in the Marmara Region to the wholesale market places in İstanbul. From these marketplaces, fresh food and vegetables are distributed to various retail points in the city. It is also observed that supermarkets use different supply channels together. Thus, in such a system, various actors are involved between the

Table1. Fresh fruits and vegetables production amount in Istanbul and its surroundings

	Fresh vegetables	Fresh fruits
Total production in the region* (kg) (2020) TURKSTAT, 2020	6,900,872,000	2,252,596,000
Production amount in Istanbul (kg) (2020) TURKSTAT, 2020	8,984,000	103,108,000
Consumption amount in Istanbul (kg)**	2,000,000,000	1,500,000,000

*Provinces in the region; İstanbul, Edirne, Tekirdağ, Kırklareli, Kocaeli, Sakarya, Yalova, Düzce, Bolu, Eskişehir, Bilecik, Bursa, Balıkesir, Çanakkale.
**Yerküre Cooperative (2021).

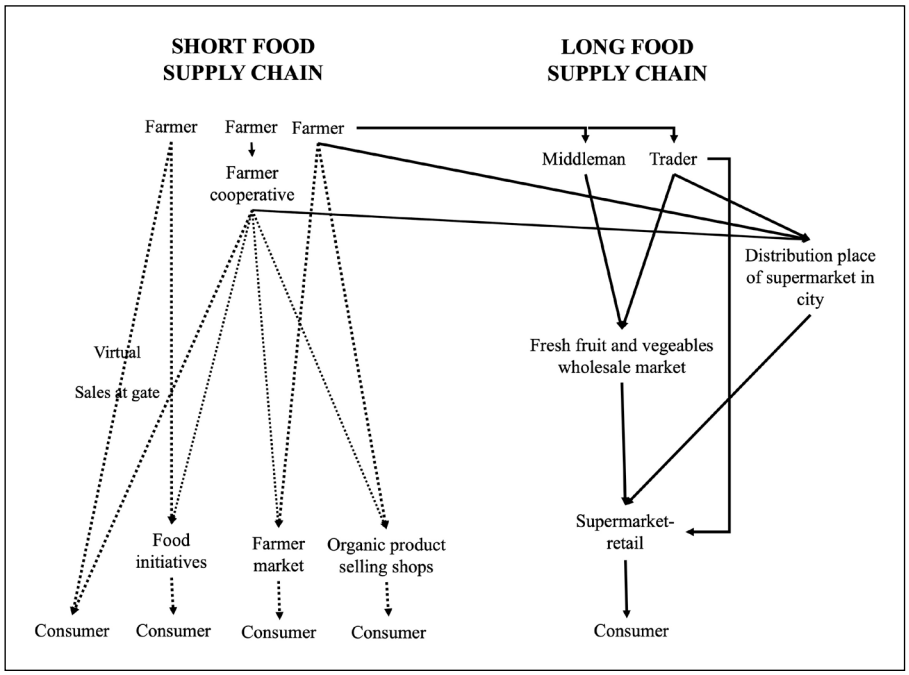

Figure 2. Dual structure in the food supply chain in İstanbul.

producer and the consumer, and this causes the chain to lengthen. On the other hand, short supply chains, which provide for a direct connection between the producer and the consumer, also have a role to play in feeding the city and catering for its food needs.

In various cities of Turkey, food initiatives (such as consumer cooperatives and food societies) and producer markets that supply the ecological and healthy goods produced by other producers, deliver the goods to the consumers in the city, and this has started to become a widespread practice. There are a total of 80 food initiatives in Turkey and 38 of them are in Istanbul (Ayalp, 2021). When the origins of the food products sold in the food initiatives are examined, it is observed that the products are supplied by suppliers

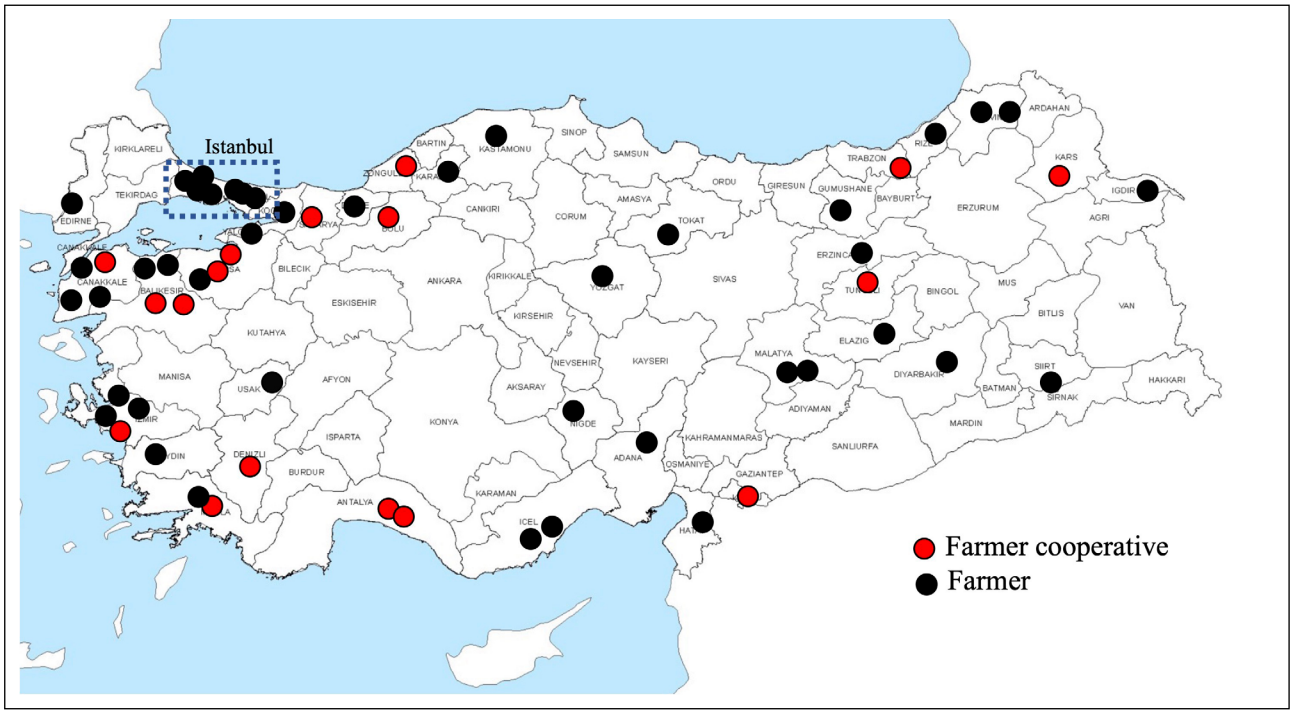

Figure 3. Production areas of food sold through food initiatives in Istanbul.

from various regions in Turkey. Interestingly, the producer information of the majority of the food products sold in the food initiatives is similar. In other words, the same producer sends products to different food initiatives. It has also been observed that the majority of fresh vegetable and fruit producers who sell to the food initiatives are based in the Marmara Region. However, other food products that do not grow in the region of Marmara are supplied from other regions of Turkey. In addition, producers supplying products to food initiatives are either individual producers or producer cooperatives (Figure 3). In the interviews conducted with the people in the different food initiatives and the producers who send their products there, it has been revealed and observed that the relations they form are mostly based on trust and closeness. When the spatial distribution is examined, it is also seen that there is a concentration in Istanbul and its immediate surroundings, and perishable food products such as milk, eggs, fresh vegetables, and fruits are the ones mostly supplied by the producers here. Similarly, when the products from the producers in the regions far from Istanbul are examined, it is observed that they consist mostly of food products that are durable such as grains and processed food.

It can also be noted that there are also 9 organic markets and producer markets in various places in Istanbul. Another important channel for direct sales is virtual platforms. With the pandemic, producers in various parts of Anatolia started to sell directly to consumers through social media or e-commerce platforms.

METHOD

With the consideration of the Covid-19 pandemic, a three-stage method was applied to determine the factors that affect (increase or decrease) the resilience of the food system in Istanbul. In the first stage, in-depth interviews with 15 people were conducted. These include the different actors such as manufacturers, representatives in the retail sector, and officials in the food initiative at different stages of the food supply chain within the scope of this study. These interviews were done to understand how food security and food supply chains in Istanbul were affected by the COVID-19 pandemic. Along with the data obtained from the interviews, a SWOT analysis was also conducted to identify the strengths, weaknesses, threats, and opportunities of the food system of Istanbul in terms of resilience. Then, the Analytical Hierarchy Model was created, and the criteria were determined within the scope of SWOT analysis. These criteria were then assigned threshold weights by the experts (11 people) for further use in pairwise comparisons. Finally, the highest-scoring criteria were matched in the TOWS matrix, and strategies (guides for decision-making processes) to increase the resilience of the food system in Istanbul against any forms of shocks and crises were developed. In this study, strategies building according to TOWS analysis presents tips for policymakers to build resilient food systems and the city-food relations in Istanbul.

Analytical Hierarchy Process (AHP) - SWOT and TOWS Analysis

The SWOT analysis is used to determine the internal capabilities or constraints (i.e., the strengths and weaknesses) and external conditions (opportunities and threats) are determined by SWOT analysis (Kajanus et al., 2004). Shinno et al. (2006) state that there is no way to determine the importance of each sub-criteria within the SWOT analysis by using the analysis itself and identifying the most decisive factors during the decision-making process is a difficult task. This is why the study has integrated the analytical hierarchy process (AHP) into the SWOT analysis. The AHP is a multi-criteria decision-making method that uses a hierarchical structure to define a problem and develop priorities before proposing

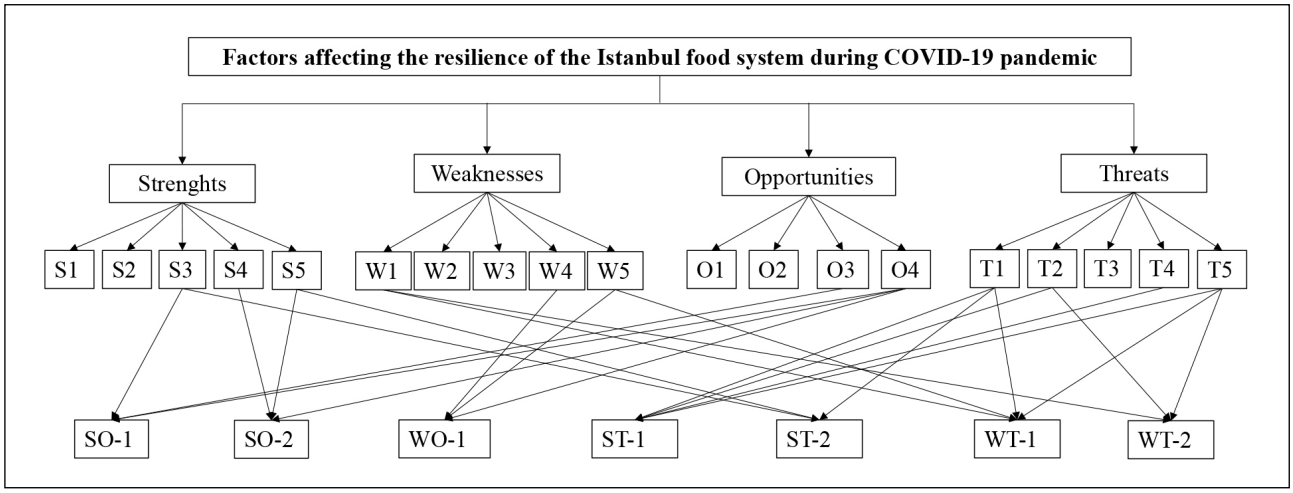

Figure 4. AHP model.

alternatives. With this method, a pairwise comparison matrix is created. To make comparisons, a number scale is required to determine how critical or dominant the criterion or features of an element are compared to those of another element (Saaty, 2008). By using the SWOT factors as shown in Figure 4, a questionnaire/survey for the pairwise comparison using the SWOT-AHP methods was created. The survey/questionnaire uses a rating scale to rate each factor relative to the others. The participants were asked to evaluate whether the factors in the pairs were equally important or whether one was more important than the other. The data obtained from the pairwise comparisons were used to obtain a priority value for each factor. Throughout the analysis, the consistency rates were maintained at <0.1 as recommended by Saaty (2008).

SWOT analysis and hierarchy model were created to understand which factors are important in assessing the resilience of the food system of Istanbul in relation to the Covid-19 pandemic (Figure 4). The first level is considered the overall target level. As for the second and third levels, there are four SWOT criteria (strengths, weakness, opportunities, threats) presented. These are classified according to nineteen sub-criteria within the scope of SWOT. Finally, in the fourth level, seven different alternative competitive strategies were evaluated in terms of the sub-criteria listed which are listed at level 3 (Table 4).

By doing a rating exercise, the scale parameters used to calculate the overall priority score for each criterion within each SWOT group are obtained. Each strength, weakness, opportunity, and threat are graded out of nine. The relative local weights of the factors were calculated using the eigenvalue calculation method. Last, the global weight of each SWOT criterion was obtained by dividing the local weight by the weight of each SWOT group (Table 2, Figure 5). Mixed-method (SWOT-AHP) provides quantitative information for the strategic planning process. As for the AHP, it helps the SWOT to be carried out more analytically way so that alternative strategies can be prioritised (Kajanus et al., 2004).

In the TOWS matrix developed by Weihrich (1982), four different types of strategies are presented (Table 3). The TOWS strategic alternatives matrix is presented in Table 2

Table 2. Weights of SWOT groups and sub-criteria

SWOT group	Weight of group	Sub-criteria of the SWOT	Weight of the factor within the group	Global weight of the factor
Strengths	0.297	S1. Presence of fertile agricultural lands within and in the vicinity of Istanbul	0.129	0.038
		S2. A multitude of chain retail companies and the rapid transition to online ordering and delivery services	0.155	0.046
		S3. The existence of alternative food networks and short supply chains	0.212	0.063
		S4. Initiatives taken by the municipalities to distribute food to the needy	0.231	0.069
		S5. Food distribution activities to help those in need through social solidarity networks	0.272	0.081
Weaknesses	0.228	W1. Small producers are not qualified enough to make direct sales online	0.102	0.023
		W2. Inability for producers to supply for the increasing demand of fresh vegetables and fruits due to their small scale.	0.174	0.040
		W3. The presence of the socio-economically weak population in Istanbul	0.188	0.043
		W4. Closure of places such as restaurants, schools and coffee shops	0.238	0.054
		W5. Producers not having the ability to sell directly to consumers	0.297	0.068
Opportunities	0.129	O1. Exemption of agricultural labour from curfews	0.164	0.021
		O2. The ongoing farming activities and operational food production plants	0.245	0.032
		O3. Producers outside of Istanbul carrying sales via social media	0.269	0.035
		O4. Increasing demand for natural and organic food	0.322	0.041
Threats	0.347	T1. Long food supply chains	0.136	0.047
		T2. Disruption in agricultural production activities due to rise in price of inputs	0.115	0.040
		T3. Shortcoming of seasonal workers in agricultural production	0.118	0.041
		T4. Dominance of companies with capital in the food supply chain - power inequality	0.255	0.080
		T5. Rising prices of food products	0.377	0.131

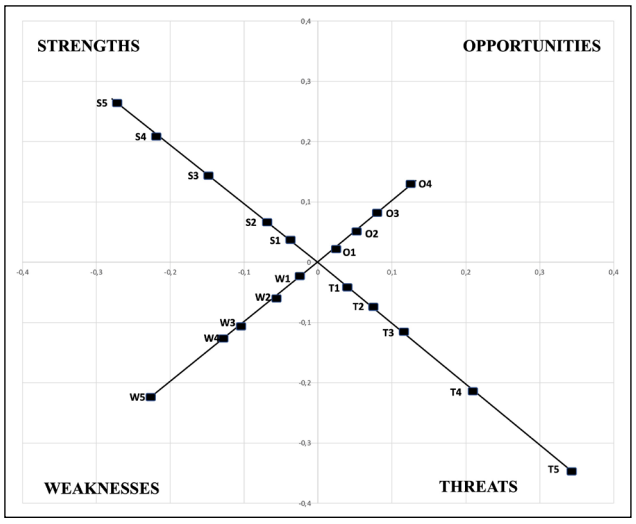

Figure 5. The results of the pairwise comparison of SWOT groups and sub-criteria.

below. These are, first, the **SO** strategies that use internal strengths to exploit the external opportunities. Second, the **WO** strategies aim to minimise the internal weaknesses or enhance the strengths to exploit external opportunities. Third, the **ST** strategies use the strengths to minimise external threats, and fourth, the **WT** strategies reduce the internal weaknesses to avoid any form of external threats (this can be considered as a defence strategy only or in other words, the worst-case scenario).

FINDINGS

As a result of the AHP analysis made within the scope of the study; It is observed that the factor of "Distributing food by the social solidarity networks to those in need (with a threshold of 0.081) is listed as the top strength for Istanbul in terms of food accessibility during the pandemic period". The factors of "Initiatives by municipalities to distribute food to those in need which has a threshold of 0.069" and "The existence of alternative food networks and short supply chains which has a threshold of 0.063 are also within the scope of their strengths and have high values" (Table 2).

It is observed that different solutions have been developed by different actors in Istanbul regarding the issue of access to food as a result of the curfews imposed during the Covid-19 pandemic. Solidarity networks have been created for the vulnerable to access food through non-governmental organisations, and the local government also procured food from local farmers at fair prices. Therefore, it can be noted that it is crucial to act in solidarity and to have mechanisms that bring the producer and the consumer together in ensuring the resilience of the food system in times of crisis.

The evaluation of the *weaknesses* of Istanbul's food system reveals that the factors with the highest value were first, the fact that the producers cannot sell directly with a threshold of 0.068, and second, the closing of places such as restaurants, schools, and cafes during the pandemic with a threshold of 0.054. The pandemic can be considered a triggering factor for manufacturers to deliver their products directly to the consumer with their means. However, the fact that the manufacturers cannot sell directly is also stated as an important shortcoming by the experts (Table 2).

In the pairwise comparison made between the factors considered as *opportunities* within the scope of the SWOT analysis, the highest value was – "An increase in demand for natural and organic food with a threshold of 0.041". With the pandemic, the trend of both producing and consuming healthy and sustainable products has also accelerated. Consumers who want direct access to healthy food have started to order products from manufacturers using the internet. The second important opportunity which is also a growing trend as explained by experts was noted as "The producers outside of Istanbul starting to sell via social media with a threshold of 0.035" (Table 2).

The factors related to threats (from the SWOT analysis) regarding the resilience of Istanbul's food system with the pandemic – "An increase in food prices with a threshold of 0.131" and "The dominance of companies with capital in the food supply chain, and power inequality with a threshold of 0.080 were noted with the highest values". These two factors stood out as the two most important factors affecting the resilience of the food system negatively (Table 2, Figure 5). The results of the AHP-SWOT analysis show that experts put more emphasis on avoiding threats while emphasising the importance of strengths. The need to avoid threats to develop Istanbul's food system more resilient is also highlighted.

After the evaluations obtained from the pairwise comparisons from the SWOT and AHP analysis, the *TOWS Strategic Alternatives Matrix* is based on the matching in Table 2. The strategies **SO-1** and **SO-2** are based on the pairing of S5, S4, S3, and O4, O3 pairing. First, **GF-1** - To ensure the expansion of alternative food networks and short supply chains for consumers to have direct access to natural and organic food. Second, **GF-2:** Strategies to expand solidarity networks for those with food access problems

Table 3. TOWS strategic alternatives matrix (Weihrich, 1982)

	STRENGTHS (S)	WEAKNESSES (W)
OPPORTUNITIES (O)	SO Strategy (maxi-maxi)	WO Strategy (mini-maxi)
THREATS (T)	ST Strategy (maxi-mini)	WT Strategy (mini-mini)

have been developed. The strategies **SO-1** and **SO-2** are based on the pairing of S5, S4, S3, and O4, O3 pairing. The strategy **WO-1** is based on the pairing Z1, F4, and F3 pairing. **WO-1** is a strategy that has been developed to develop mechanisms that enable producers of natural and organic agricultural products to sell directly to consumers. The strategies **ST-1** and **ST-2** are based on the pairing of S5, S4, S3, and T1 pairing. First, **ST-1** – Shortening the food supply chain strategy, and second, **ST-2** – Addressing the development of the food system with a regional approach for sustainability and resilience. The strategies **WT-1** and **WT-2** are based on the pairing of W1, W2, and T1, T2 pairing. First, **WT-1** – Increasing the capacity of small producers to make direct sales. Second, **WT-2** – A strategy has been developed to reduce the dependency on inputs in agricultural production and to increase the incentives and training to ensure the farmer's transition to sustainable and ecological agricultural production methods (Table 4). By matching the factors with the highest value using the TOWS analysis, the solution proposals were developed. This analysis shows that there is a need for a spatial, organisational, and relational reorganisation of the food supply chain in a way that the urban-rural relations are strengthened. In other words, the strategies outlined here were created to address issues that are important to the resilience of Istanbul's food system.

CONCLUSION

The urban food systems are likely to face more frequent shocks in the future. After the effects of the Covid-19 global epidemic on the functioning of Istanbul's food system are examined in this article, it has been observed that the pandemic is a driving force in restructuring Istanbul's city-food relations. Based on the study carried out to determine what Istanbul can do to make its food system resilient and to prepare it against risks and uncertainties, it has been concluded that the supply chains should be shortened, and mechanisms, where the producers are empowered and can directly reach the consumers, should be developed. Herein, there is also the need to strengthen the producer's production and management capacity. In the AHP and TOWS analysis conducted within the scope of the study, the lack of capacity and skill to sell products directly to the consumer by the manufacturer was also observed. Therefore, there is a need for training and financial support to strengthen the production capacity.

Another result obtained from this study is that the relatively socio-economically weak population of Istanbul has poor access to food. It also emerged that during the pandemic, solutions provided by the locals were successful. It is vital to promote such solidarity networks and ensure their sustainability. In addition, it is observed that urban

Table 4. TOWS strategic alternatives matrix for İstanbul food system

	STRENGTHS	**WEAKNESSES**
	(S5) 0.272	(W5) 0.297
	(S4) 0.231	(W4) 0.238
	(S3) 0.212	(W3) 0.188
	(S2) 0.155	(W2) 0.174
	(S1) 0.129	**(W1) 0.102**
OPPORTUNITIES	**(maxi-maxi)**	**(mini-maxi)**
(O4) 0.322	(S5, S4, S3; Q4, Q3)	(W1; O4, O3)
(O3) 0.269 (O2) 0.245 (O1) 0.164	**SO-1:** Ensuring the proliferation of alternative food networks and short supply chains such that consumers have direct access to natural and organic food	**WO-1:** Developing mechanisms that enable producers to sell healthy and organic agricultural products directly to consumers.
	SO-2 Strategies to expand solidarity networks for those with food access problems have been developed	
THREATS	**(maxi-mini)**	**(mini-mini)**
(T5) 0.377	(S5, S4, S3; T1, T2)	(W2, W1; T1, T2)
(T4) 0.255 (T3) 0.118 (T2) 0.115 (T1) 0.136	**ST-1:** Development of shortened the food supply chain	**WT-1:** Increasing the know-how and knowledge of small producers on how to sell products directly
	ST-2: Addressing the development of the food system with a regional approach for sustainability and resilience	**WT-2:** Reducing the dependency on input in agricultural production and facilitating the transition of farmers to sustainable and ecological agricultural production methods

agriculture also has a high potential and can be applied to feed the fragile population. The lessons drawn from the pandemic have also led the local authorities in Istanbul to give more importance to urban agriculture and address food security. Numerous projects to cater for the food needs of the city, especially the fragile population were developed. However, these practices should be expanded.

The Covid-19 pandemic has offered the opportunity to increase food systems' resilience and take steps toward its transformation. In many countries, efforts to initiate short food supply chains have increased. Manufacturers have responded to demands during curfews and market closures by moving their sales online due to social distancing rules (IPES-Food 2020, FAO 2020). Non-governmental organisations mobilised and formed solidarity networks to provide healthy local food to vulnerable population groups. Some local governments in cities like Wuhan, New York, Milan, Tel Aviv, and Johannesburg have propelled initiatives to prevent increased food insecurity during COVID-19 by establishing systems to identify those who are vulnerable and deliver food to them. Some local governments such as those in Toronto have also collaborated with non-governmental organisations to achieve this. In the case of the city of Seattle, the local governments have provided a healthy diet for vulnerable citizens through food vouchers. Similarly, in some cities such as Milan and Washington, online maps have been generated to identify the vulnerable and deliver food to them (Carey et al., 2020). This has also created an opportunity to re-establish physical and relational connections between the producer and the consumer.

The Covid-19 pandemic showed that the dependence of cities on external sources for their food needs should be reduced and in turn, their self-feeding capacity should be increased. The research also showed that food security, especially in a big metropolis like Istanbul where approximately 19% of Turkey lives is an issue of real importance. At this point, it is important to ensure that there are sustainable agricultural areas in Istanbul and its immediate surroundings. This is how it will be possible to create self-sufficient resilient food systems. In other words, it is necessary to address the food system by considering the spatial dimension, to strengthen the link between urban and rural areas, both to increase the resilience of the food system against shocks and to ensure the accessibility of food within short distances.

As a result, spatial and organisational arrangements are needed for a more resilient food system in Istanbul and to ensure that healthy and safe food is available to everyone in the society. The current situation shows that there is a necessity for a perspective that encompasses the city with its vicinity. Local governments, non-governmental organisations, central government, and the private sector are effective in creating and maintaining the city-food relationship. Therefore, there is a need for proper governance mechanisms for all actors to act together. Further studies could consider how should be governance mechanisms.

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