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Analyzing the Factors Affecting the Sustainable Urban Agricultural Development in Tehran Metropolis (Case Study: 22 Districts of Tehran)

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Abstract

The present study aimed to analyze the factors affecting the sustainable urban agricultural development in 22 districts of Tehran metropolis. This causal-comparative study was non-experimental in terms of controlling the studied variables. It was based on a survey strategy and sought to discover the relationships between the dimensions of urban agriculture, as well as those between variables through using a structural equation model. Additionally, the study was a correlational research of variance-covariance matrix analysis type because of applying the structural equation modeling to assess the intended conceptual model. The statistical population included all residents in Tehran city who practiced farming in the city environment (urban agriculture) during 2018 under the supervision of the municipalities of 22 districts (n: 240). Further, the sample size was estimated 145 by considering the table of Bartlett et al. (2001), followed by selecting the participants by using stratified random sampling method (according to their district). A researcher-made questionnaire was utilized, the validity of which was determined by using content and construct validity. Furthermore, the reliability of the tool was confirmed using Cronbach's alpha, sequential theta, and composite reliability tests. In this study, the urban farmers of Tehran introduced the social, economic, spatial, environmental, and subjective components as important, respectively. Based on the model of the factors affecting the sustainable urban agricultural development in the 22 districts of Tehran metropolis, subjective, economic, spatial, social, and environmental dimensions with the coefficients of 0.24, 0.19, 0.14, 0.09, and 0.08 had the greatest effect on sustainable urban development, respectively.

Keywords: Sustainable development, Sustainable urban development, Urban agriculture, Urban management

Introduction

The rapid urban expansion and urban population growth are considered as one of the most crucial phenomena caused by the economic development and industrialization of countries (Malekinezhad et al., 2020). This

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phenomenon is associated with higher food demand and food supply for millions of people (Jahed et al., 2021). In addition, the lack of agricultural products and increasing price of food are among the most important problems which human society is facing in the 21st century since the world will become urbanized in the future by continuing the trend (Jahed et al., 2021). Today, the agricultural sector cannot take the appropriate and balanced steps which keep up with population growth, and the activities carried out to resolve this inconsistency play a major role in destabilizing the cities. Accordingly, many citizens are looking for another way to get food. Rethinking the process of production to consumption process and self-sufficiency of urban needs can be addressed as one of the proposed solutions. Therefore, a new type of local agriculture has emerged in the form of urban agriculture during the present century (Pourjavid et al., 2021).

Urban and suburban agriculture is practiced within and around the borders of cities worldwide, and includes agricultural, animal husbandry, fishing, and tree-planting products within the boundaries of cities, as well as non-consumable products such as ecological services. Further, it covers multiple agricultural and gardening systems close to cities, and various approaches from backyard farming to extensive urban gardening, hydroponic greenhouses, and aquaculture (FAO, 2015). Urban agriculture is considered as an opportunity to positively affect the world food system and produce high-quality food in close areas. According to FAO (2011), the proper understanding of urban agriculture implies food security and income generation through various agricultural and domestic activities. The FAO reported that urban farmers supply the food needs of 700 million individuals around the world by farming in empty spaces, backyards, and building roofs in cities (Orsin et al., 2013). In this regard, the results of the studies and experiences in various countries represented a close correlation between urban agricultural activities with food security, food diversity, and adequate diet nutritionally (Malekinezhad et al., 2020).

Accordingly, conserving urban ecosystems, providing the sustainability and ecological functions of human development, and managing green spaces in the urban areas have currently become an important objective in urban management (Jazayeri et al., 2021). From the perspective of sustainable development, green space plays crucial tasks in the sustainability of a city through ecological effects. Furthermore, population growth, migration, and industrial development have led to the physical urban development, population density in urban areas, marginalization, adverse traffic, and environmental pollution. Thus, urban agriculture is facing with problems such as improper establishment and location in the city, as well as using inappropriate spaces, not respecting neighbors, and not paying attention to per capita and standards (Pourjavid et al., 2019). The change in the face of Tehran city and unawareness about the present structural conditions, as well as the construction of taller residential units, higher role of building communal areas, and lack of executive solutions and relevant rules

(in the field of ownership) have created obstacles for urban agriculture in the city (Jahed et al., 2021). Additionally, the air pollution crisis and challenges have been intensified in the province, especially in Tehran. The efficient urban agricultural management plays a role in the production and an improvement in qualitative and quantitative urban indexes, and consequently pollution reduction and weather cleanliness in the city. Therefore, the development of urban agricultural management is essential, which can be highlighted by planners and provincial officials to solve the pollution crisis (Porjavid et al., 2020).

The sustainable development field has occupied an extended part of urban planning literature during the recent decades (Hosseini et al., 2020). Nowadays, urbanism has been associated with unsustainability in cities and surrounding areas by following the stereotyped models of urban development (mainly modern) which ignores the local conditions and characteristics (Zabardast & Darskhan, 2021). Thus, sustainable urban development approaches and strategies are considered as one of the important issues and first planning priorities in various countries across the world (Meschede, 2019). In Iran, the development of cities, especially the metropolises, has not been in line with sustainability, similar to the other developing countries (Zabardast & Darskhan, 2021). The issue is attributed to the fact that urbanization and population growth, and consequently city development are among the characteristics of the present era, and sustainable development depends on efficient management and planning. Further, examining sustainable development issues in the form of public and private policies requires management performance, and its achievement necessitates the double efforts and cooperation of government institutions. The institutions should coordinate and balance between different forces, and themselves take a reasonable power in terms of the sustainable development of the city (Zabardast & Darskhan, 2021). Currently, explaining the role of the urban management system in the sustainable urban development refers to understanding how the social, economic, institutional, political, and executive capacities, and urban society influence enhancing sustainability and identifying its various dimensions in the cities. Therefore, decision makers and planners should pay attention to sustainable development in the urban management system as one of the most crucial component of urban planning for system responsibility and improvement in the cities of Iran (Jazayeri et al., 2021). In fact, the sustainable development of urban and suburban agriculture can be effective in dealing with the existing crises (Drikvand et al., 2021). Furthermore, it has multidimensional developmental effects on any society to complete urban food needs, provide ecosystem and environmental services, promote cultural and social values, and even increase economic resistance (Ebadi & Mohebi, 2021).

Literature review

Various studies have been conducted on urban agriculture in Iran and other countries.

For example, Pourjavid et al. (2021) assessed the effectiveness of urban agricultural training based on the Kirkpatrick's model among Tehran citizens during the third quarter of 2017. In general, the reaction of the respondents (55%) to the training was good. In addition, a significant difference was detected between the knowledge status of the citizens before and after attending the course, and the training affected their behavior positively and favorably.

Jazayeri et al. (1400) evaluated the environmental capability of Tehran city for the strategic planning of urban green space development by considering the Quantitative Strategy Planning Matrix (QSPM). They introduced strategies such as the effective monitoring of the proper enforcement of urban agriculture regulations in the field of green spaces in Tehran, preparation of comprehensive urban agriculture plan (regarding green spaces), and management of the damages caused by non-human factors like pests, plant diseases, and adverse issues in the field of urban green spaces as the most important existing strategies for the urban agricultural management regarding green spaces of the city, respectively.

Further, Jahed et al. (2021) systematically reviewed the strategies to design urban agriculture body, and classified the body-related data into legal, technical, agricultural, and security. The results revealed the association of the components with expanding urban agriculture, protecting and enhancing environmental diversity, helping to create job, solving poverty problem, improving food security, increasing social interactions, decreasing air pollution, and managing waste, as well as its use in the consumption cycle of urban agriculture in cities.

According to Drikvand et al. (1400), some factors influenced the sustainable development of urban and suburban agriculture with an entrepreneurial approach such as providing economic grounds and investing in urban and suburban agriculture, developing urban and suburban agricultural infrastructure, and spreading the culture and spirit of agricultural entrepreneurship in the region and local beneficiaries. Furthermore, the others are the development of innovation, and new methods and technologies in urban and suburban agriculture, and empowerment and participation of urban and suburban agricultural beneficiaries, as well as institutional development in line with urban and suburban agricultural entrepreneurship.

Khalilnezhad (2021) focused on planning considerations and spatial characteristics, as well as the principles of urban agricultural landscape design according to the Persian garden prototype to identify spatial characteristics for introducing the principles.

Ebadi and Mohebi (2021) conducted a study by implementing an urban agriculture plan to analyze the effects of urban agriculture on the social capital of stakeholders. They reported the multidimensional effects of urban agriculture on any society for completing urban food needs, providing ecosystem and environmental services, enhancing cultural and social values, and even improving economic resistance. Social capital, as one of the important effects of urban agriculture, causes the conditions for strengthening social interaction, participation, and trust, and

makes a ground for culture-building commensurate with urban agricultural development. The results can be used in the process of macro policy-making and planning about agriculture, and creating new social capitals in the country.

Zabardast and Darskhan (2021) identified the classes, subclasses, and subcategories of the structure of the urban management model of sustainable development based on the Iranian metropolises through employing customary or conventional qualitative content analysis. Additionally, economic, cultural-social, institutional, and environmental-physical capacities, as the components of achieving sustainable development, were explained in the urban management structure of the metropolises for the first time.

Karami and Salahi Esfahani (2020) indicated the significant effect of training on urban agricultural development, as well as the considerable role of this development in sustainable urban development. They proposed culture-building and training to develop urban agriculture.

Malekinejad et al. (2020) studied the role of urban agriculture in promoting agricultural productivity and food security, and introduced the purposeful entry of urban agriculture into urban landscape as a new solution to deal with environmental, social, and economic problems. Proper management, as well as producing food on rooftops, backyards, and suitable urban areas enables to meet citizens' food needs and maintain urban environment quality. Further, low-income individuals get an opportunity to achieve food security by creating jobs and declining domestic food costs. Yadavar et al. (2020) analyzed urban agricultural capacities and found that the highest loading factor was related to the urban agricultural capacity to manage surface water for feeding groundwater aquifer.

As already mentioned, urban agriculture has been examined by several researchers in the world. According to Artmann et al. (2021), urban agriculture increases social capital and participation in social networks, and leads to greater cohesion, trust, and interaction among citizens.

Caputo et al. (2021) focused on applying food-energy-water nexus approach in urban agriculture and reported that small-scale agriculture has significant social effects along with affecting food and economic security considerably.

Furthermore, Diekmann et al. (2020) evaluated the social benefits of local urban food system and declared that the lands used for urban agricultural activities are more a place for cultural and social gatherings than the agricultural production.

Siegner et al. (2018) analyzed the literature on agriculture and urban food systems to understand the effect of the food produced in cities on the food security of society. They assessed the role of urban planning, food policy, and civil partnership in creating urban agricultural areas, as well as how the spaces extend food justice and security. The results emphasized the presence of limited research about urban agriculture despite its several advantages.

FernándezAndrés (2017) investigated urban agriculture as a planning strategy to address social-ecological justice. The results demonstrated an important role of urban

agriculture in closing the gap in food needs so that this type of agriculture is a significant evolution beyond the aspects of the entire food supply chain and systematic changes.

Conceptual model and research hypotheses

Based on the results of the previous studies, urban agricultural development has various dimensions. Increasing urban production, using the existing facilities optimally, establishing a healthy living environment for citizens, improving healthy food access, and consuming low energy for food production, as well as cost-effectiveness are among the components of urban agriculture (Martellozzo et al., 2014; Lee-Smith, 2010; Kangethe et al., 2007; Longley et al., 2006; Rana, 2006; Ratta & Naser, 1996).

In addition, urban agricultural development influences sustainable urban development. The results of several studies suggested urban poverty reduction, local employment enhancement, waste recycling, and a decrease in water, soil, and air pollution as the aspects emphasized in the sustainable urban development (Dubbeling & Zeeuw, 2011; Mougeot, 2006; Rabinowicz, 2002; Altirei et al., 1999).

However, the dimensions can be expanded so that Zeunert (2018) considered spatial, social, economic, environmental, and subjective ones for urban agriculture by extending its components. Thus, a conceptual model was developed based on the literature review (Fig. 1).

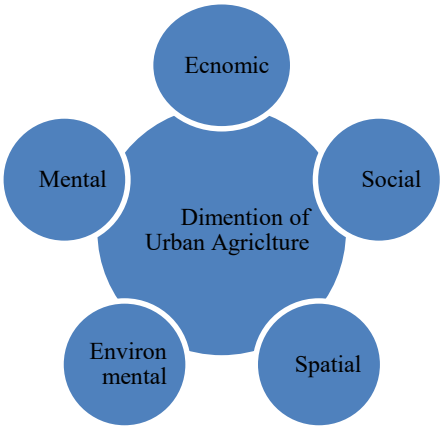

Fig. 1. Conceptual model of the study

Given the theoretical foundations under study, the hypotheses are assumed as follows.

1- The subjective dimension of urban agriculture is effective on the sustainable urban agricultural development in Tehran metropolis.
2- The economic dimension of urban agriculture plays a significant role in the sustainable urban

agricultural development in Tehran metropolis.

3- The social dimension of urban agriculture affects the sustainable urban agricultural development in Tehran metropolis.
4- The environmental dimension of urban agriculture influences the sustainable urban agricultural development in Tehran metropolis.
5- The spatial dimension of urban agriculture is considered as an important factor on the sustainable urban agricultural development in Tehran metropolis.

Methods and Materials

The present quantitative study was considered as a non-experimental study with respect to the control of the assessed variables and conducted based on a survey strategy. Further, it was a correlational research and variance-covariance matrix analysis since the conceptual model was analyzed by using the structural equation modeling. The statistical population included all the individuals living in Tehran city who farmed in the city environment (urban agriculture) during 2018 under the supervision of the municipalities of 22 districts (n: 240). A list of urban farmers was prepared by referring the municipalities of the districts, and 145 participants were selected through employing the proportional stratified random sampling method (according to their district). The table of Bartlett et al. (2001) was utilized to estimate the sample size. Furthermore, the study was performed by using a researcher-made questionnaire. The validity of the tool was assessed using content and construct validity, while Cronbach's alpha, sequential theta, and composite reliability tests were applied to determine its reliability.

Table 1. Validity and reliability of the various dimensions of the questionnaire

Dimension	AVE	CR	Cronbach's alpha (α)
Economic	0.563	0.864	0.775
Social	0.512	0.789	0.701
Spatial	0.577	0.881	0.787
Environmental	0.622	0.912	0.812
Mental	0.634	0.941	0.844
Total	0.630	0.896	0.823

After completing the questionnaires, the data were analyzed using SPSS 22 and LISREL 8.5 statistical software.

Data analysis

Most of the urban farmers under study were male (55.17) and married (79.31), aged 46-55 years (62.09%), and held a bachelor's degree (48.97%). The participants had averagely 9.31 years of experience in gardening and

greenhouses (SD = 5.35), and the majority produced ornamental plants (22.1%).

Table 2. Ranking the five dimensions of urban agriculture

Dimension	M	SD	Coefficient of variations (CV)	Rank
Social	4.13	0.72	0.17	1
Economic	3.72	0.70	0.19	2
Spatial	3.52	0.76	0.21	3
Environmental	3.45	0.73	0.21	4
Mental	3.61	0.79	0.22	5
Total	3.69	0.74	---	---

As shown in Table 2, the total mean is 3.69 (SD = 0.74) out of 5, reflecting the moderate importance of all the five dimensions from the perspective of urban farmers in Tehran. According to the participants, the social aspect is the most crucial component, followed by economic, spatial, environmental, and subjective ones, respectively.

Factors affecting the sustainable urban agricultural development in the 22 districts of Tehran metropolis

The results indicated the accepted fit of the whole model based on the indexes presented in Table 3, especially RMSEA, CFI, and NNFI, which are more recommended to judge the fit of model.

Table 3. Various fit criteria of the whole model

Accepted limit	Obtained value	Index
P > 0.05	P = 0.08	Chi-square (P-value)
0.0729 < RMSEA < 0.0979	0.0854	RMSEA (90%)
NNFI > 0.9	0.889	Non-Normed Fit Index (NNFI)
CFI > 0.9	0.902	Comparative Fit Index (CFI)
GFI > 0.9 CN > 90.186	0.816 140	Goodness of Fit Index (GFI) Critical N (CN)

Given the standardized loadings, "Reducing unemployment rate in the city" (A9) and "Preparing a suitable space for environmental learning, sports, and physical activities" (A12) with the factor loading of 0.72 and 0.73 had the highest effect on the economic and social dimensions, respectively. Regarding the spatial, environmental, and subjective ones, the greatest effect was observed in "Improving scenery around buildings" (A20, 0.79), "Increasing the life of the roof through planting and promoting the performance of thermal and sound insulation" (A34, 0.75), and "Strengthening the sense of equality among citizens due to fair access to green space services" (A46, 0.72) in order (Table 4).

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Table 4. Factor loading of the dimensions of urban agriculture, as well as their items

Dimensions of urban agriculture	Factor loading	Item	Symbol	Factor loading
Social (soc)	1.12	Spreading the culture of the appropriate use of green space	A10	0.58
		Strengthening the interaction and social solidarity of citizens	A11	0.62
		Preparing a suitable space for environmental learning, sports, and physical activities	A12	0.73
		Increasing the social and cultural communications between city with suburb and village	A13	0.46
		Creating a place to rest and relieve fatigue	A14	0.53
		Reducing crime	A15	0.68
		Enhancing women's presence, and creating the sense of security and pleasure	A16	0.71
		Supplying citizens' food needs	A17	0.64
		Applying educated individuals in the agricultural sector	A18	0.71
Economic (eco)	0.48	Providing a space for citizens to generate income	A1	0.52
		Establishing a local economy to produce healthy and organic food	A2	0.63
		Increasing real estate price	A3	0.67
		Decreasing consumer groups compared to the producers	A4	0.65
		Generating job opportunities (new income resources and livelihood) for low-income groups	A5	0.66
		Declining food transportation costs	A6	0.52
		Attracting tourists and booming business in the city	A7	0.44
		Financial saving on food bills	A8	0.52
		Reducing unemployment rate in the city	A9	0.72
Spatial (spi)	0.45	Utilizing abandoned lands and more optimal use of urban spaces	A19	0.51
		Improving scenery around buildings	A20	0.79
		Allocating places for sports and walking	A21	0.63
		Using the roof, yard, gardens, and public open space, and creating multifunctional areas	A22	0.57
		Increasing green spaces per capita	A23	0.44
		Decreasing the distance and access time to urban services (e.g., green spaces)	A24	0.66
		Enhancing the visual attractiveness of the city	A25	0.54
		Promoting the communications between the various neighbourhoods of the city	A26	0.67
Environmental (env)	0.40	Preventing soil erosion by constructing a protective coating	A27	0.53
		Keeping the air clean due to the presence of more plants in the city	A28	0.67
		Diminishing surface runoff	A29	0.71
		Remedying soil texture and reinforcing poor soil	A30	0.68
		Reducing sound pollution	A31	0.53
		Cleaning polluted soil	A32	0.71
		Assisting in urban water management, as well as consuming collected rainwater and wastewater	A33	0.67
		Increasing the life of the roof by planting and promoting the performance of thermal and sound insulation	A34	0.66
		Agricultural product biodiversity	A35	0.75

		Preventing animals from dying due to chemical pollution	A36	0.67
Subjective (sub)	0.35	Decreasing the psychological and mental vulnerability of citizens against ecological changes	A37	0.55
		Relieving the mental fatigue induced by daily activities	A38	0.52
		Improving self-confidence and mood	A39	0.51
		Applying the creativity and ideas of citizens in production	A40	0.60
		Strengthening the mentality of usefulness and effectiveness in the urban society	A41	0.70
		Establishing a sense of attachment between space and human through plant cultivation	A42	0.69
		Reducing stress and creating relaxation	A43	0.53
		Promoting residents' attitude towards their city and neighbourhood	A44	0.60
		Forming a sense of belonging between the individual and city	A45	0.66
		Strengthening the sense of equality among citizens due to fair access to green space services	A46	0.72
		Increasing citizens' recreations	A47	0.54
		Enhancing the learning and skill of citizens regarding agriculture	A48	0.67

Based on the t-value in Fig. 3, the latent variables (structure) are significantly correlated to the observed ones (model measurement), interpreting the relationships provided in Fig. 2. The standardized loadings (Fig. 2) suggested social (1.12), economic (0.48), spatial (0.45), environmental (0.40), and subjective (0.35) dimensions as the most effective aspects, respectively. Accordingly, the hypotheses were confirmed, implying that the components of urban agriculture affect the sustainable urban agricultural development in Tehran city.

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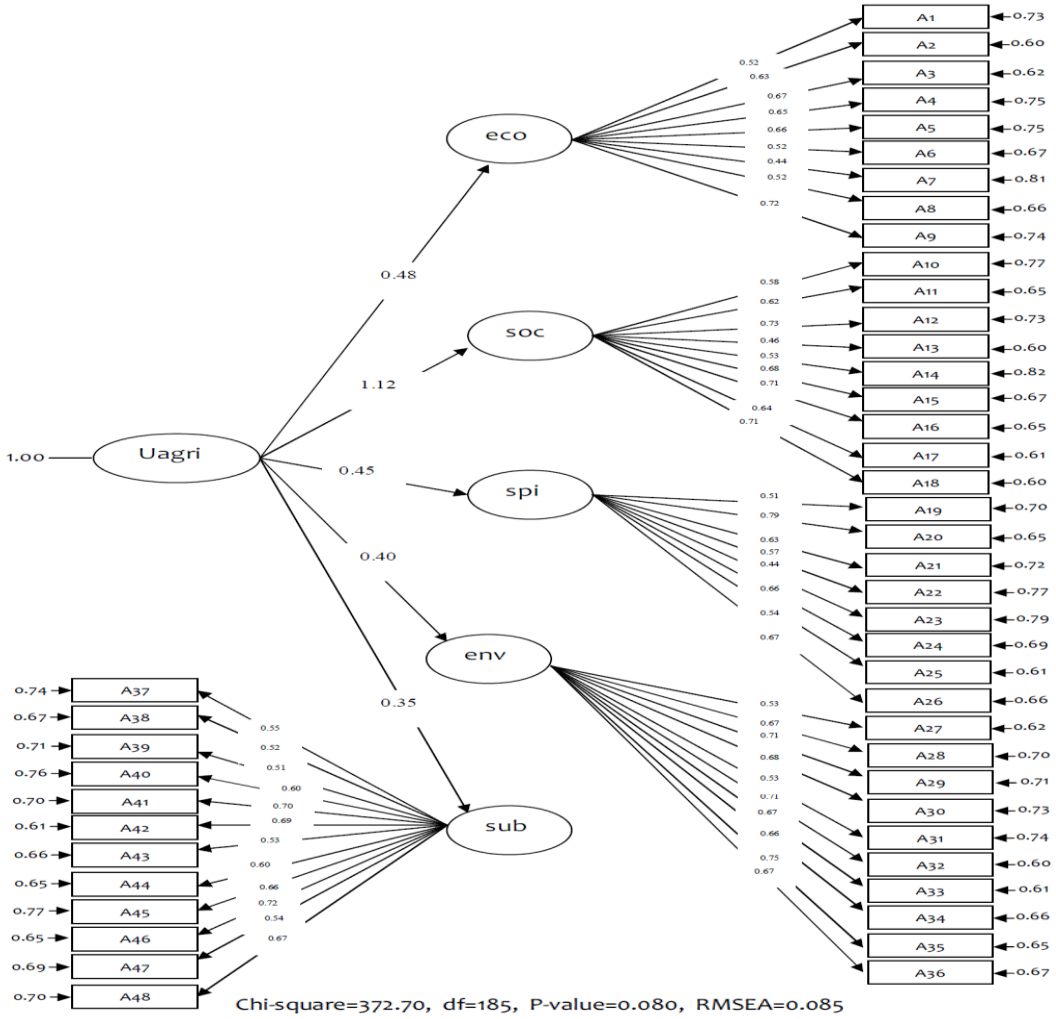

Fig. 2. The standardized loadings for the variables of the model of sustainable urban agriculture development in the 22 districts of Tehran metropolis

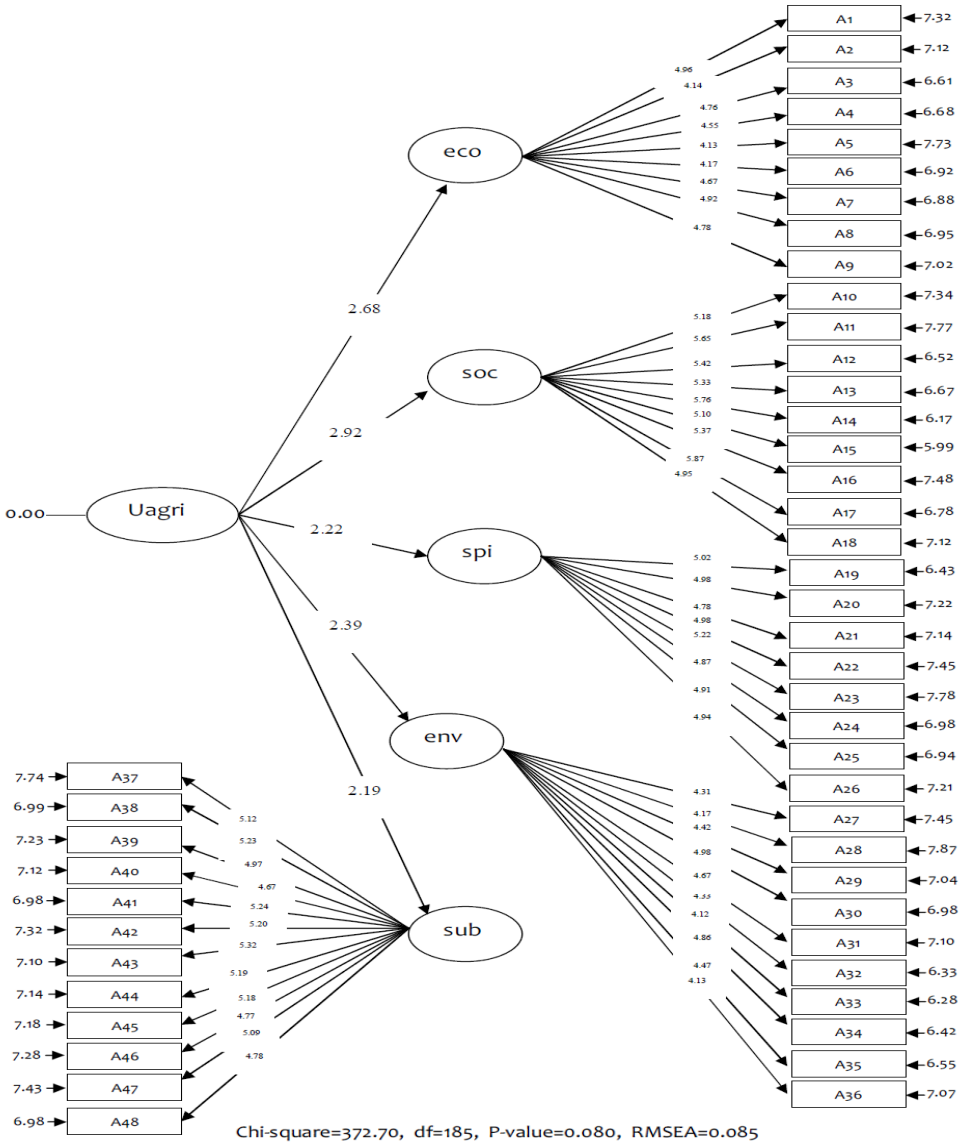

Fig. 3. T-values for the relationships between the variables of the model of the sustainable urban agriculture development in the 22 districts of Tehran metropolis

Discussion and conclusion

Tehran is the main city of Iran with about 20% of the country's population, and its evolutions can directly influence the entire country. Thus, it should be highlighted more than the other cities in Iran in terms of sustainable urban development. During the recent decades, this city has faced many problems such as elevating environmental pollution, reducing ecological power, confiscating the resources of the supporting area, increasing the loading on the environment (Jazayeri et al., 2021), and especially weakening urban management with respect to supply and city administration

(Jazayeri et al., 2021; Adine Vand et al., 2013). All of the above-mentioned issues confirm that the ecological space of the metropolis becomes more unsustainable. Population growth, migration, and industrial development are associated with the physical urban development, population density in the cities, marginalization, adverse traffic, and environmental pollutions (Jahed et al., 2021). The issue results in polluting air and not managing waste, and consequently contaminating soil and water pollution. Additionally, the decreased green areas in Tehran have enhanced greenhouse effect, causing the rising health problems for residents such as cancers, and respiratory and heart diseases. In this regard, urban agriculture has been proposed as one of the debatable answers to the problems (Jahed et al., 2021; Poursaeed et al., 2021). Given that urban agriculture contributes to air pollution reduction through air-freshening, the extension and development of the activities related to this type of agriculture in the cities solve their air pollution problem to a large extent (Yadavar et al., 2020). Further, the green use model should be integrated with other performances like economic, social, and cultural ones, and attention should be paid to urban agricultural expansion the urban body of the area. This issue is attributed to the fact that urban agriculture is known as one of the resources for supplying urban food systems, and provides food security (Malekinezhad et al., 2020). Furthermore, the member states of the United Nations consider this type of agriculture as an important strategy to achieve the third millennium development goals (Pourjavid et al., 2019). It seems that urban agriculture can help realize the horizon of the 20-year vision, posing health, welfare, food security, and proper income distribution away from poverty, corruption, and discrimination, as well as benefiting from favorable environment. Therefore, it is necessary to pay attention to urban agriculture as a main policy in the urban planning process. Thus, the present study tried to analyze the factors affecting the sustainable urban agricultural development in the 22 districts of Tehran metropolis in order to facilitate the implementation of urban agriculture.

The results revealed that social dimension imposed the maximum effect on urban agriculture in the city, which is consistent with those of some studies which suggested this component as one of the most effective parameters on urban agricultural development (Pourjavid, 2020; Siegner et al., 2018; FernándezAndrés, 2017; Anguelovski, 2016; Mcclintock & Simpson, 2016; Mirtorabi et al., 2016; Goodling et al., 2015; Hamidi & Yaghoubi, 2014).

Regarding the economic dimension, the common perspectives emphasize providing food security (Altieri et al., 1999), turning the wheels of the economy in big cities (Badami & Ramankutty, 2015), and establishing economic-social balance (Carmona, 2003). Some researchers have mentioned the economic functions of urban agriculture such as attracting tourists and boosting business (Cavallo & Di Donato, 2015), increasing land and real estate price, and consequently enhancing the taxes received by municipalities (Land Use Consultants, 2004). In the present study, the economic aspect was

detected as the second affecting factor, which is in line with those of the previous studies which indicated the importance of this component in urban agriculture (Hosseininia et al., 2016; Barthel et al., 2015; Cavallo & Di Donato, 2015; Lupia & Pulighe, 2015; Drake, 2014; Mohammadi, J. & Soleimani Shiri, 2014; Opitz et al., 2016; Mok et al., 2014; Valipour et al., 2013; Crouch, 2012; Pourjavid et al., 2011).

The farmers under study ranked spatial dimension as the third parameter influencing the urban agricultural sustainability in the 22 districts. The urban agricultural development strengthens urban use space (Land Use Consultants, 2004). The results are in line with those of other studies which emphasized the effectiveness of the component on urban agricultural application. For example, researchers have referred to a reduction in land use conflicts (Mirtorabi et al., 2013), location access (Anguelovski, 2016), land-use improvement (Barthel et al., 2015), spatial justice (Siegner et al., 2018), and higher demand for arable spaces in cities (Crouch, 2012). In addition, urban spatial development in the form of green neighborhoods (Draper & Freedman, 2010), spatial balance in urban development (Goodling et al., 2015), and spatial development caused by government and organizational support at the local, regional, and country levels (Mot et al., 2014) were considered as the aspects of the dimension. The other aspects included the spatial balance between city and village (Orsini et al., 2013), as well as developing intercity communication network (Colasanti et al., 2012), forming new urban spaces with diverse functions (Taylor Lovell, 2010), and designing resistant cities (Pearson et al., 2010).

The environmental dimension was introduced as the fourth effective factor, which is in agreement with those of various studies (Lupia & Pulighe, 2015; Mohammadi, J. & Soleimani Shiri, 2014; Taylor Lovell, 2014, 2010; Orsini et al., 2013; Rozati & Ghanbaran, 2013; Millward & Sabir, 2011).

Finally, the subjective one was the fifth parameter affecting urban agricultural development in Tehran, which is consistent with those of some other studies (Cavallo & Di Donato, 2015; Pearson et al., 2010; Chiesura, 2004).

Suggestions

Based on the results of the present study, the social and economic dimensions were determined as the most important components of urban agriculture, respectively. Thus, the following suggestions are presented to strengthen the aspects.

- Urban agricultural activities must be organized to build capacity regarding urban agriculture and facilitate processes such as problem identification, need assessment, puzzle out, implementation, and systematic monitoring. For this purpose, it is suggested to establish a department in the municipalities of the districts for organizing urban agricultural activities.
- Despite the importance of the social dimension in the urban agricultural application in Tehran city, relevant informative programs are low and

citizens are not aware of the executive processes in this field. Accordingly, the capacity of television and radio networks must be utilized to familiarize the citizens of Tehran with the urban agricultural benefits and existing service situation for using urban agriculture in order to improve social component. To this end, Tehran municipality is recommended to announce its supporting programs through presenters in public media.

- It seems necessary to attract the citizen participation by using informative and encouraging educational and extensional programs extension agents. In this regard, the agents can implement pilot projects on the facade and roof of commercial buildings to exhort citizens, encourage the consumption of natural and organic urban agricultural products, and appreciate exemplary citizens in terms of urban agricultural activities. Further, introducing compatible plant species with high value added, exhorting educational institutions and students to study urban agriculture and share the results with all citizens in Tehran, and formulating programs for the volunteer producers to monitor the gardens and farms of the municipalities of 22 districts can be addressed as the other recommendations for the extension agents.
- Regarding the economic dimension, the urban agricultural development, as well as how to exploit land and physical resources is proposed to be revised for enhancing the economic component. Thus, urban arable lands should be identified, and the necessary planning should be made by urban agricultural actors to attract the participation of land owners.
- To strengthen the economic aspect, it is suggested to increase investment on this type of agriculture. In fact, success in urban agriculture highly depends on investment and sufficient financial resources. Local governments and urban management should make the necessary policies and laws on supplying financial resources, especially for low-income individuals and residents in marginalized areas.
- In the case of this dimension, an improvement in the physical infrastructure and capacity is essential for the urban agricultural development. The enhancement can be achieved through constructing parks, expanding balconies to prepare a planting space, and designing private and non-private areas for utilizing available energy resources optimally and ensuring the existence of high-quality pollution-free soil for agricultural activities. Furthermore, the other measures include developing greenhouses on the roofs of houses, creating a farming space in schools, and

performing a monitoring program to create and align the equipment and facilities of buildings for aquaculture and agriculture.

- In general, the following suggestions are provided to strengthen the economic component of urban agriculture for the sustainable urban agricultural development in the 22 districts.
- Considering tax deduction for buildings with green roof or roof garden
- Providing primary inputs at appropriate prices for the contractors of urban agricultural projects
- Giving urban awards for all kinds of urban agricultural activities of citizens like those in balconies and roofs
- Granting low-interest facilities for domestic agricultural business by the Agriculture Bank of Iran
- Buying the composts made from household waste in the city and applying it in gardening to grow organic products

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