ASSESSING THE SUSTAINABILITY OF URBAN AGRICULTURE: THE CASE OF ÇANKAYA MUNICIPALITY

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ABSTRACT

ASSESSING THE SUSTAINABILITY OF URBAN AGRICULTURE: THE CASE OF ÇANKAYA MUNICIPALITY

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Agriculture, as the basic economic activity carried out inside the city, has had both economic and social meaning for people since ancient times. However, industrialization caused an increase in the priority of non-agricultural activities in cities. As a result, agricultural activities had lost their importance inside cities, and were becoming mostly related to a rural context.

Although agriculture is generally associated with a rural context, the economic, social, and environmental problems originated by rapid urbanization, rural migration to cities, high level of unemployment, and urban poverty caused a rise in agricultural activities in the urban context. This new trend is called “Urban Agriculture”.

Urban agriculture is developing rapidly worldwide because of its positive impacts in economic, social, and environmental areas. It is claimed that urban agriculture undoubtedly plays an important role in the future of the developing and developed cities and their sustainability. Therefore, it has started to be used as a sustainable development strategy in many countries.

In that regard, understanding the relationship between urban agriculture and sustainability, and assessing the contributions of urban agriculture on sustainability have gained importance.

Although various authors have claimed that there is a strong positive relationship between urban agriculture and sustainability, more analytical framework is required to construct a better understanding of the relationship between urban agriculture and sustainability.

Therefore, the aim of the thesis is to present an assessment framework to define the relationship between urban agriculture and sustainability. This relationship has been examined with various themes and indicators in the literature in terms of the economic, social, and environmental dimensions of sustainability. Then urban agriculture activities of Çankaya Municipality in Ankara were assessed in light of these themes and indicators.

Keywords: Urban Agriculture, Sustainability of Urban Agriculture, Contribution of Urban Agriculture to Sustainability

ÖZ

KENTSEL TARIMIN SÜRDÜRÜLEBİLİRLİĞİNİN DEĞERLENDİRİLMESİ: ÇANKAYA BELEDİYESİ ÖRNEĞİ

Doğan, Şeyma Başak
Yüksek Lisans, Şehir Planlama, Şehir ve Bölge Planlama
Tez Yöneticisi: Prof. Dr. Serap Kayasü

Ocak 2022, 160 sayfa

Tarım, kent içinde yürütülen en temel ekonomik faaliyet olarak, antik çağlardan beri insanlar için hem ekonomik hem de sosyal bir anlam ifade etmiştir. Ancak sanayileşme, kentlerde tarım dışı faaliyetlerin önceliğinin artmasına neden olmuştur. Sonuç olarak, tarımsal faaliyetler şehir içindeki önemini yitirmiş ve daha çok kırsal bağlamla ilgili faaliyetler haline gelmiştir.

Tarım genellikle kırsal alanla ilişkilendirilse de hızlı kentleşme, kırsaldan kentlere göç, kentte yüksek işsizlik ve kentsel yoksulluğun yol açtığı ekonomik, sosyal ve çevresel sorunlar kentsel bağlamda tarımsal faaliyetlerin artmasına neden olmaktadır. Bu yeni akım "Kentsel Tarım" olarak adlandırılmaktadır.

Kentsel tarım, ekonomik, sosyal ve çevresel alanlarda olumlu etkileri olması nedeniyle Dünya genelinde hızla gelişmektedir. Kentsel tarımın gelişmekte olan ve gelişmiş kentlerin geleceği ve sürdürülebilirliği açısından kuşkusuz önemli bir rol oynadığı iddia edilmektedir. Bu nedenle, kentsel tarım birçok ülkede sürdürülebilir kalkınma stratejisi olarak kullanılmaya başlanmıştır.

Bu noktada kentsel tarım ve sürdürülebilirlik ilişkisinin anlaşılması ve kentsel tarımın sürdürülebilirliğe katkılarının değerlendirilmesi önem kazanmaktadır. Çeşitli yazarlar kentsel tarım ve sürdürülebilirlik arasında güçlü bir pozitif ilişki

olduğunu iddia etseler de kentsel tarım ve sürdürülebilirlik arasındaki ilişkiyi anlamak için daha analitik bir çerçeveye ihtiyaç vardır.

Bu nedenle tezin amacı, kentsel tarım ve sürdürülebilirlik arasındaki ilişkiyi tanımlamak için bir değerlendirme çerçevesi sunmaktır. Bu ilişki, sürdürülebilirliğin ekonomik, sosyal ve çevresel boyutu açısından literatürde bulunan çeşitli tema ve göstergelerle incelenmiştir. Ardından Ankara Çankaya Belediyesi'nin kentsel tarım faaliyetleri bu temalar ve göstergeler ışığında değerlendirilmiştir.

Anahtar Kelimeler: Kentsel Tarım, Kentsel Tarımın Sürdürülebilirliği, Kentsel Tarımın Sürdürülebilirliğe Katkısı

to the stars in the sky;

Şefika, Semiha, Mert’e...

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LIST OF ABBREVIATIONS

ABBREVIATIONS

COST: European Cooperation in Science and Technology

FAO: Food and Agriculture Organization of the United Nations

SDGs: Sustainable Development Goals

CHAPTER 1

INTRODUCTION

1.1 Problem Statement

Agriculture has been a significant part of people's lives since they began to live in permanent settlements, because initially agricultural activities enabled people to feed themselves and then gain an income. It has had both economic and social meaning for people since ancient times. In other words, it is said that the journey of civilization began with agriculture.

In the earliest times, agriculture was the basic economic activity that was conducted inside the city. With industrialization, the priority of non- agricultural activities inside the city rose. As a result, agriculture became an activity located outside of the city. Agricultural activities had lost their importance inside cities and were becoming mostly related with a rural context.

Although agriculture generally is associated with a rural context, in recent years it has also appeared in urban areas. The rapid process of urbanization and migration all over the world has led to a rise in various urban problems such as the high level of unemployment, the insufficient provision of food, the increase in urban poverty, increased pollution in cities, and so on. The economic, social, and environmental problems that originated from rapid urbanization, rural migration to cities, high level of unemployment, and urban poverty have caused agricultural activities to rise in urban context. This new trend is called "Urban Agriculture".

Urban agriculture activities can be seen in the large and industrialized cities like New York, Montreal, Chicago, Berlin, Vancouver and so on. It is estimated that there are 80,000 people involved in urban agriculture activities in Berlin. In addition, there are approximately 1,000 community gardens in New York and more than 150

community gardens in Boston that bring together more than 10,000 people (Duchemin, Wegmuller, Legault, 2009, p.43).

Urban agriculture is developing rapidly worldwide because of its positive impacts in the economic, social, and environmental areas. It is claimed that urban agriculture undoubtedly plays an important role in the future of the developing and developed cities and their sustainability. Therefore, it is starting to be used as a sustainable development strategy in many countries.

In that regard, understanding the relationship between urban agriculture and sustainability, as well as evaluating the contributions of urban agriculture on urban sustainability, gain an importance. Like Game and Primus stated, the major challenges of urban agriculture are determining the monitor and control mechanisms of urban agriculture, in terms of the physical (environmental), economic, and social areas, and understanding urban agriculture as a sustainable component in global terms (2015, p.2). In other words, investigating the effects of urban agriculture on economic, social, and environmental areas in cities and evaluating these effects in terms of sustainability are a significant issue to have better understanding about urban agriculture as a tool of sustainability.

Various authors have studied potential contributions of urban agriculture to increase urban living standards, resilience, and sustainability. Many of them claim that there is a strong positive relationship between them. However, more analytical framework is required to construct a better knowledge regarding the relationship between urban agriculture and sustainability (Vasquez –Moreno & Cordova, 2013, p. 201).

Therefore, finding answers to the questions below is crucial for better understanding the urban agriculture activities.

- What is the relationship between the concepts of urban agriculture and sustainability?
- What are the contributions of urban agriculture activities in economic, social, and environmental dimensions of sustainability?

- What is the most suitable approach to the assessment of the sustainability of the urban agriculture activities in terms of economic, social, and environmental dimensions?

1.2 The Aim and Scope of Research

In consideration of the problem statement, mechanisms for evaluating the contribution of urban agriculture to sustainability are needed. Thanks to these mechanisms, we are able to define, monitor and control whether urban agriculture activities are a sustainable development tool for cities or not.

Therefore, the aim of the thesis is to construct better knowledge of the relationship between urban agriculture and sustainability and to assess the sustainability of urban agriculture activities of Çankaya Municipality in Ankara. The effectiveness and contributions of these activities regarding the economic, social, and environmental dimensions of sustainable urban development will be studied. For that purpose, I aim to develop an indicator set to assess the sustainability of urban agriculture and then the sustainability of urban agriculture activities of Çankaya Municipality will be assessed in accordance to this created indicator set. In that regard, the Research Question of the thesis is:

- What is the relationship between the concepts of urban agriculture and sustainability?

The following sub-questions are also significant in order to answer the Research Question:

- What are the contributions of urban agriculture activities in economic, social, and environmental dimensions of sustainability?
- What is the most suitable approach to the assessment of the sustainability of the urban agriculture activities in terms of economic, social, and environmental dimensions?

Therefore, in this thesis, the concept of urban sustainability will be briefly identified in order to provide general information regarding its scope. After that, the literature review will be conducted regarding this concept of urban agriculture. The concept of urban agriculture will be examined by its history, its different approaches, and its contributions to sustainability. Then various studies dealing with assessing the sustainability of urban agriculture activities will be explained. The methods of this assessment research will be evaluated in detail and the indicator set of thesis that assesses the sustainability of urban agriculture will be formed by making a synthesis of the indicators used in existing research.

After literature reviews, according to created set of indicators, the urban agriculture activities of Çankaya Municipality will be assessed.

1.3 Methodology

The concept of the thesis is to explain urban sustainability, urban agriculture, and the relationship between them by dealing with a specific case. In other words, the thesis requires an evaluation of the relationship between urban agriculture activities and sustainability and the contribution of urban agriculture activities to sustainability in an area. Therefore, the thesis has adopted the case study approach as a qualitative research methodology. This methodology was selected because it provides flexibility and rich descriptive information in observation for exploratory studies that have a lack of documentation (Vásquez-Moreno & Córdova, 2013, p.207). The semi-structural interviews and questionnaire methods were used as a qualitative research tool.

According to Vasquez and Anderson (2001), “Social research methods such as survey, questionnaire, case study and interviews have been generally used to assess the impact or contribution of urban agriculture on sustainability issues”. Similarly, the thesis aims to assess the contribution of urban agriculture in terms of the economic, social, and environmental dimensions of sustainability in the specific

locations: Mutlukent and Ata Urban Agriculture Areas. Therefore, the case study method was used. The analysis of the case study included a qualitative methodology as mentioned before. Firstly, the study was started with a literature review to create a general overview regarding sustainability and urban agriculture. This provided general understanding of the concepts. Then, a comprehensive documentary analysis was conducted to identify the contributions of urban agriculture to sustainability. In that part, several articles regarding the contributions of urban agriculture were analyzed. Related topics that demonstrated the contribution of urban agriculture to sustainability in each article were grouped and then coded as a set of themes. In consequence of documentary analysis, different themes regarding the contribution of urban agriculture to sustainability were created. After that, existing case studies that assess the sustainability of urban agriculture were examined to identify sustainable urban agriculture indicators. While choosing these studies, it was important that they included case study. And then, the contribution themes and the indicators were combined and synthesized, so the indicator set of thesis was formed to assess sustainability of urban agriculture activities.

For the case study, two examples of the urban agriculture activities of Çankaya Municipality were chosen which are Urban Agriculture Houses in Ata and Mutlukent neighborhoods. The case study areas are distinctly intra-urban, so urban agriculture experiences in peri-urban and suburban areas were not covered by the scope of the thesis. In light of the literature review, data was collected through semi-structured interviews with municipality officers and through questionnaire study with people who participated in urban agriculture activities in case study areas. Data collection included two steps. Firstly, a pilot case study was conducted. The Çankaya Municipality and Mutlukent Urban Agriculture Areas were visited and a group of open-ended questions were presented to people there. These semi-structured interviews were conducted with people working in Urban and Agriculture Study Group in Çankaya Municipality. The questions in the interviews were divided into four parts:

1. Questions related to general information about urban agriculture studies and applications in Çankaya.
2. Questions related to economic sustainability.
3. Questions related to social sustainability.
4. Questions related to environmental sustainability.

After conducting a pilot case study, the data obtained by literature review and pilot case study were combined and questions were created for the questionnaire. The questionnaire studies were conducted in the case study areas. In the questionnaire study, the indicator set of thesis was tested to evaluate the contributions of the urban agriculture activities to urban sustainability in Çankaya. As mentioned previously, the indicator sets were formed in accordance with the data obtained from existing case studies in literature and the pilot case study. The questionnaire consisted of the economic, social, and environmental sustainability parts. The open-ended, closed-ended and Likert scale questions in the questionnaire tested each indicator set related to economic, social and environmental dimensions of sustainability. The pilot case study was conducted in March – April 2020. The questionnaire was applied in June and September 2020 with participants in case study areas. Moreover, due to the pandemic, some parts of the questionnaire study had to be conducted online. Therefore, the online survey was conducted via Google Forms in August 2020– May 2021. This led to reaching more participants who had attended the urban agriculture houses in previous years.

The Yes/No and Likert scale questions were evaluated by percentages in terms of Mutlukent and Ata Urban Agriculture Houses. Content analysis was made in order to evaluate open-ended questions. Some keywords related to the set of indicators were searched in participants' answers. Then, these keywords were coded to find out the frequency of mentions and their percentages were compared.

The methodology steps could be summarized as 1) The review of the literature on the concept of sustainability and urban agriculture, 2) Analyzing and identifying the contributions of urban agriculture to sustainability, 3) Finding the existing studies regarding the assessment of sustainability of urban agriculture, 4) Evaluating the

current indicators in the existing research, 5) Concluding with the indicator set of thesis to assess urban agriculture activities, 6) Data collecting and analyzing the case study by using the created indicators in semi-structural interviews and questionnaires.

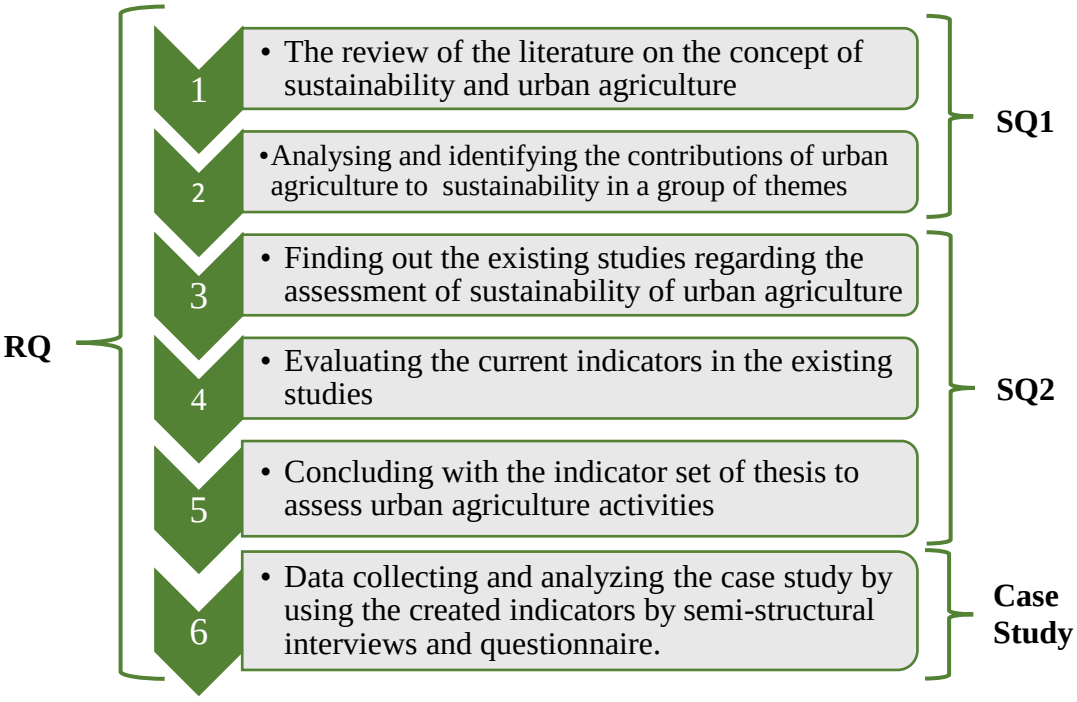


Figure 1.1. Methodology Steps

1.4 Thesis Outline

The thesis consists of five chapters.

Chapter 1 includes brief summary regarding problem statement, the aim and scope of the study and identifies research questions and research methodology.

Chapter 2 includes literature review regarding the concepts of sustainability and urban agriculture. The main focus of this chapter is defining and analyzing these concepts. For that purpose, the first section briefly summaries the concept of the sustainability by providing general information of its origin, definitions, and

dimensions. In the second section, concept of urban agriculture is reviewed by identifying its history and definitions.

Chapter 3 aims to investigate and clarify the relationship between urban agriculture and sustainability. For that purpose, firstly the urban agriculture term is analyzed in the context of global sustainability perspectives. Then, the contributions of urban agriculture to sustainability are analyzed in the context of a set of themes. After identifying contributions themes, different assessment frameworks regarding sustainability of urban agriculture are mentioned. These frameworks provide a set of indicators that are used for assessing the sustainability of urban agriculture. After that, thesis' own set of indicators are created in the light of mentioned themes and indicators.

Chapter 4 includes the case study of this thesis. Firstly, a brief background information regarding urban agriculture in Turkey and in Ankara. After that, Urban agriculture activities of Çankaya Municipality were defined in terms of COST's definition mentioned in literature review. Then, sustainability of current urban agriculture activities of Çankaya Municipality was assessing in terms of economic, social, and environmental assessment indicators.

Chapter 5 concludes all of the research and analyses.

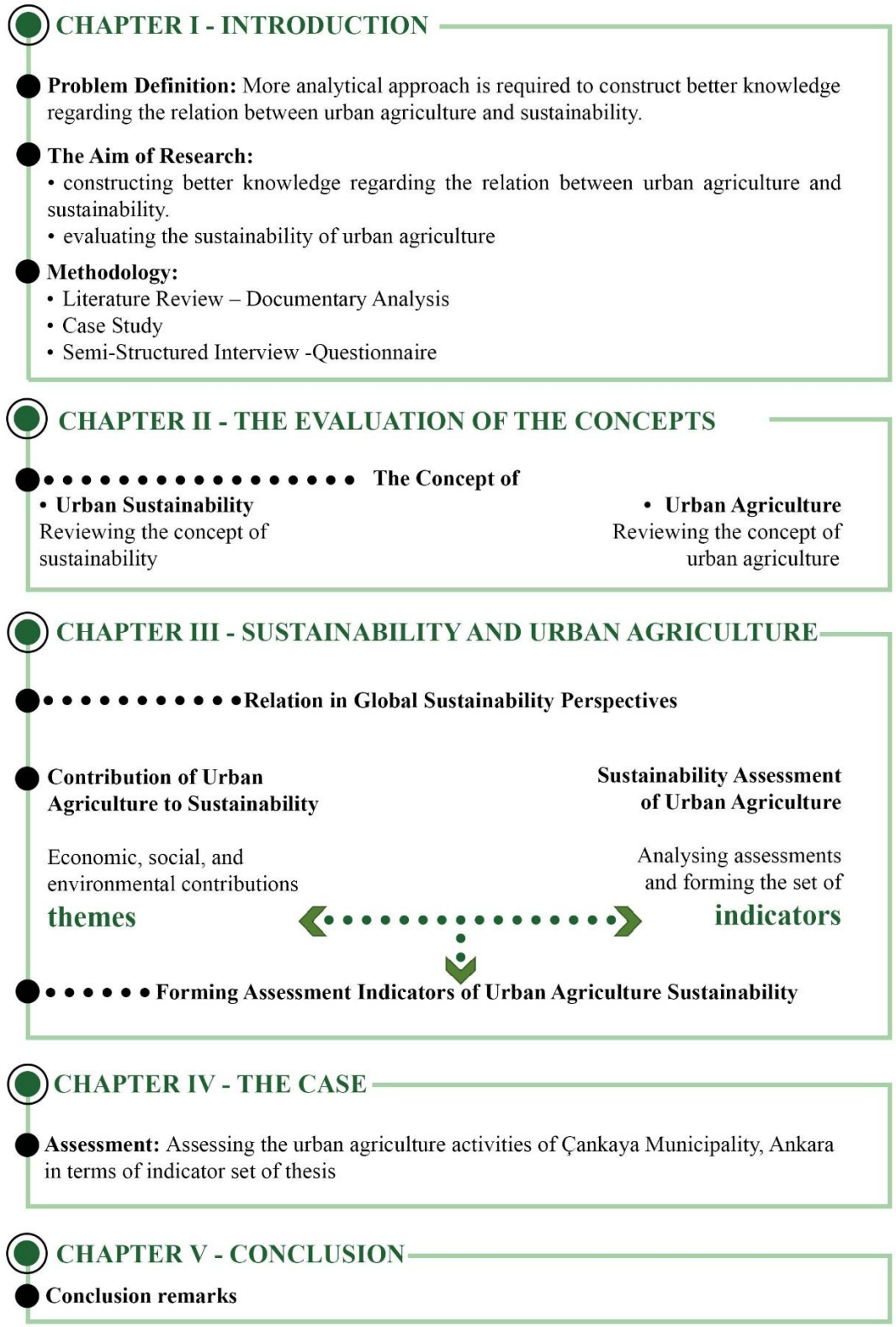


Figure 1.2 The flow schema of the thesis

CHAPTER 2

THE EVALUATION OF THE CONCEPTS

2.1 The Concept of Sustainability

The urbanization process, defined as a movement of people from rural to urban areas, has developed fast worldwide. As a consequence of rapid urbanization, urban population has been increasing by the migration from rural to urban. In detail, the urban population in the World arose from 33.6% in 1960 to 55.7% in 2019. It is projected that this rapid pace will continue to increase in the future. Urban population is projected to be 68.3% in 2050 (Ritchie and Roser, 2020).

Table 2.1 The ratio of urban population in total population between 1960-2050.
Source: The World Bank and Ritchie & Roser, 2020.

Year	Ratio
1960	% 33,6
1980	% 39,3
2000	% 46,6
2019	% 55,7
...	...
2050	% 68,3

Due to the rapid urbanization process, the growing urban population causes several problems in urban areas such as urban poverty, high level of pollutions, food security, etc. These problems are often positively correlated with socioeconomic and environmental factors.

According to Gray, Diekmann, and Algert (2017), rapid growth has caused significant social, economic, and especially environmental pressures in cities, such as pollution, habitat loss, temperature rise, etc. Dölekoğlu and Gün (2017) support this idea by claiming that this rapid growth causes social and spatial inequalities,

urban spread, unplanned urbanization, weak urban-rural links, and social-spatial difficulties. Besides these problems, the increased urban population leads to malnutrition, food insecurity, and food self-sufficiency problems in urban areas. Decreasing arable land caused by rising rapid urbanization puts pressure on agriculture, so food security and food self-sufficiency will become the main problem for future generations (Eigenbrod and Gruda, 2015).

These problems show that rapid urbanization caused the loss of valuable ecosystems in urban areas and lands to satisfy urban demands. If the same resource consumption in urban areas lasts without caring about the future needs, serious economic, environmental, and social problems will occur (Shen, Ochoa, Shah, & Zhang, 2011).

Therefore, these problems force countries to take some measures to overcome the negative consequences of the urbanization process. Sustainability is one of the leading and prominent topics of political agendas and scientific studies in that context. The sustainability of urban areas should play a central role in both science and policy arenas as long as urbanization continues to increase (Huang, Wu, & Yan, 2015, p.1176). At that point, providing sustainable development in urban areas gains importance in solving economic, social, and environmental problems of urbanization. The origin and definition of sustainability will be summarized in the next part in order to understand the general concept of sustainability.

2.1.1 The Origin, Definitions, and Dimension of the Sustainability

To eliminate the negative consequences of urbanization, many international organizations and research institutions have conducted studies regarding sustainability and sustainable development since the 1970s. They formed several key concepts and a series of initiatives to define sustainability and its indicators (Huang et al., 2015, p.1176). Currently, sustainability is a comprehensive concept that addresses several disciplines.

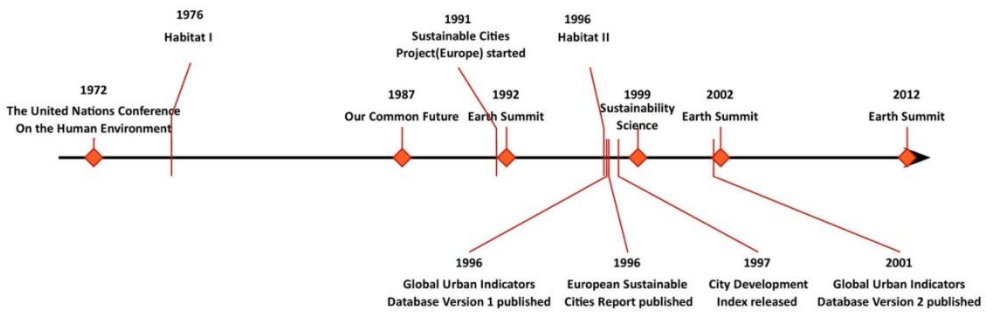


Figure 2.1. Timeline of some important events in history of urban sustainable development. (Source: Huang, Wu and Yan, 2015, p.1176)

The Figure above shows the timeline of significant events in the history of sustainable development. These events have defined the sustainability concept and offered initiatives that help to reach sustainable development for countries. The most critical sustainability events will be briefly mentioned to provide a general understanding of sustainability concepts in global perspectives in that part. The relationship between urban agriculture and these events will be explained in Section 3.1.

The history of the sustainability term has started in 1972 with The UN Conference on the Human Environment and in 1976 with Habitat I. After these, the most known event associated with sustainability is the 1987 Brundtland Report. The concept of sustainability has been significant for the city since it was mentioned in the Brundtland Report in 1987. The report defined sustainable development as:

> *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs"* (WCDE,1987, p.43).

Moreover, this report mentions the necessity of the harmony of the social, economic, and environmental aspects of sustainable development.

After that, Agenda 21 - Earth Summit in UNCED in Rio de Janeiro, Brazil, in 1992 provided concrete actions and policies regarding ensuring sustainable development.

Besides the harmony and interaction between economic, social, and environmental aspects, this conference emphasized the significance of balance between these three.

After these, several conferences have been carried out regarding sustainable development such as UN City Summit in İstanbul in 1996, the World Summit for Sustainable Development in Johannesburg in 2002, etc. Currently, the United Nations Department of Economic and Social Affairs adopted the 2030 Agenda for Sustainable Development in 2015. The agenda consists of 17 Sustainable Development Goals (SDGs) with strategies that improve education, health, economic growth while reducing inequality. The SDGs have related thematic issues, including water, energy, climate, urbanization, transport, science, and technology, which involve the three sustainability dimensions. These goals provide capacity building and support for all countries in a global partnership. 17 SDGs, seen in

Figure 2.2, refer to a broad development area from poverty to climate action. Food security and sustainable agriculture are also a part of considering the issue on the agenda. Primarily, Goal 2. focuses on achieving food security, improving nutrition, and promoting sustainable agriculture.

Figure 2.2. Seventeen Sustainable Development GoalsSource: https://www.un.org/development/desa/disabilities/about-us/sustainable-development-goals-sdgs-and-disability.html

The conferences' fundamental common issues regarding sustainability consist of economic, environmental, and social concerns for future life and needs. The fair and equity development in each economic, social, and environmental dimension and balance between three are essential aims in sustainable development.

Within the context of these conferences, many sustainability models have been built to define the fundamental issues and requirements of sustainability. Sustainability has been defined in various ways with different criteria and emphases in these models (Huang et al., 2015, p.1177). Study of the Huang et al. and Bhanot et al. compiled the different definitions of sustainability in their study.

United Nations Human Settlement Programme (1996) defined sustainable development as combining *"**economic development, social development, and environmental protection,** with full respect for all human rights and fundamental freedoms, including the right to development, and offers a means of achieving a world of greater stability and peace, built on an ethical and spiritual vision."* Definition emphasized the cooperation of the economic, social, and environmental considerations in sustainable development. Besides cooperation, United Nations Centre for Human Settlements (1997) defined reaching a sustainable city as having achievement in social, economic, and physical development all together. Also, Carter and Rogers' sustainability definition emphasized the achievement of social, environmental, and economic goals. Moreover, sustainability is defined as *"a wise **balance among economic development, environmental stewardship, and social equity.**"* by Sikdar (2003). Therefore, success in balancing economic, environmental, and socio-cultural development is another requirement to reach a sustainable city (Mega & Pedersen, 1998).

Table 2.2 Sustainability definitions

(Source: Adapted from Huang et al., 2015, p.1178 and Bhanot, Rao, & Deshmukh, 2019)

Author (s)	Sustainability Definition
United Nations Human Settlements Programme (UN-Habitat) (1996)	‘‘Sustainable development of human settlements **combines economic development, social development and environmental protection,** with full respect for all human rights and fundamental freedoms, including the right to development, and offers a means of achieving a world of greater stability and peace, built on ethical and spiritual vision.
United Nations Centre for Human Settlements (Habitat) (1997)	‘‘A sustainable city is a city where **achievements in social, economic, and physical development** are made to last and where there is a lasting supply of the natural resources on which its development depends.
Mega and Pedersen (1998)	‘‘A sustainable city is one which succeeds in **balancing economic, environmental and socio-cultural progress** through processes of active citizen participation’’
Sikdar (2003)	“Sustainability: A wise **balance among economic development, environmental stewardship, and social equity**.”

Briefly, the study stated that most of the definitions described sustainability by focusing on:

- The improvement of long-term human well-being by balancing the three dimensions of sustainability (economic, social, and environmental),
- Minimizing resource consumption and environmental damage,
- Maximizing resource use efficiency,
- Ensuring equity and democracy.

Definitions in literature show that most of them include economic, social, and environmental considerations. They focus on the economic, social, and environmental development in considering harmony, interaction, and balance between them. These are classified as three dimensions of sustainability. Figure 2.3 shows the different conceptualization of these three dimensions. The sustainability concept focuses on enhancing the development in these economic, social, and

environmental dimensions. Each dimension of sustainability deals with some development issues.

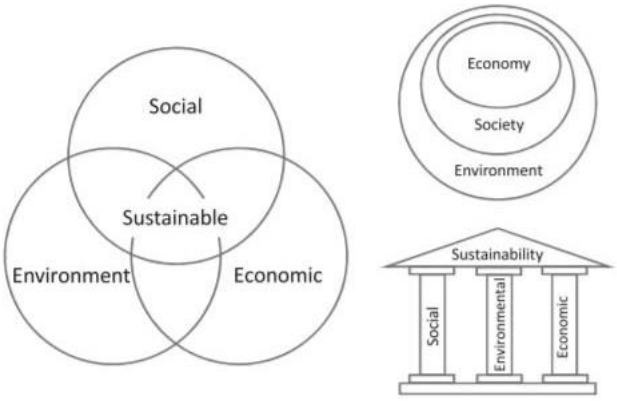


Figure 2.3. Different conceptualizations of the three dimensions of the sustainability. (Source: Purvis, Mao, Robinson, 2019, p.682)

Vasquez-Moreno & Cordova classified related issues with the economic, social, and environmental dimensions summarized in Table 2.3. According to them, the environmental dimension deals with issues related to the quality of air, water, soil, and the use and management of natural resources. Economic dimension interests to income, expenses, savings, employment generation, and market development. On the other hand, the social dimension deal with social relationship, employment, housing, etc. and to the satisfaction of basic human needs, emphasizing respect for humans and the environment (Vasquez-Moreno, & Cordova, 2013, pp. 205-206)

Table 2.3 Issues of three dimensions of sustainability.

Source: Vasquez-Moreno, & Cordova,2013 and Nurse, 2006

Economic Dimension	• Issues related to income, expenses, savings, employment generation and market development
Social Dimension	• Issues that influence social relationship, from social norms to education, nourishment, employment, housing, and security. • Issues related to the satisfaction of basic human needs, emphasizing respect for humans and the environment, in a context of justice and equity.
Environmental Dimension	• Issues related to quality of air, water, soil. • Issues related to the use and management of natural resources.

Sustainability definitions and characteristics prove that achieving sustainability depends on how reaching harmony, interaction, and balance in development in these three dimensions. The indicators of economic, social, and environmental dimensions are essential to assess sustainability. Therefore, the sustainability of urban agriculture was assessed by considering the three dimensions of sustainability in this thesis.

2.2 The Concept of Urban Agriculture

2.2.1 The History of Urban Agriculture

Agriculture has always been a part of human life, so it has a long history from ancient times to the present. In ancient times, there is no distinction between urban and rural areas. Agriculture was made where the city itself was located, in other words, in an urban area. Aztec and Maya cases proved the existence of urban agriculture in

ancient cities. In these civilizations, there was evidence for agricultural production within residential areas with a special agricultural method named as “chinampas” (Isendahl & Smith,2013, p.137-141). Mesoamerican cities were also practiced in urban agriculture in their ancient settlements (Stark & Ossa, 2007). Another early example of urban agriculture was Machu Picchu in Peru in the 16th century. It practiced self-sufficient food production with special irrigation and waste management system (Lovell,2010, p.2504; Smit, 2002)

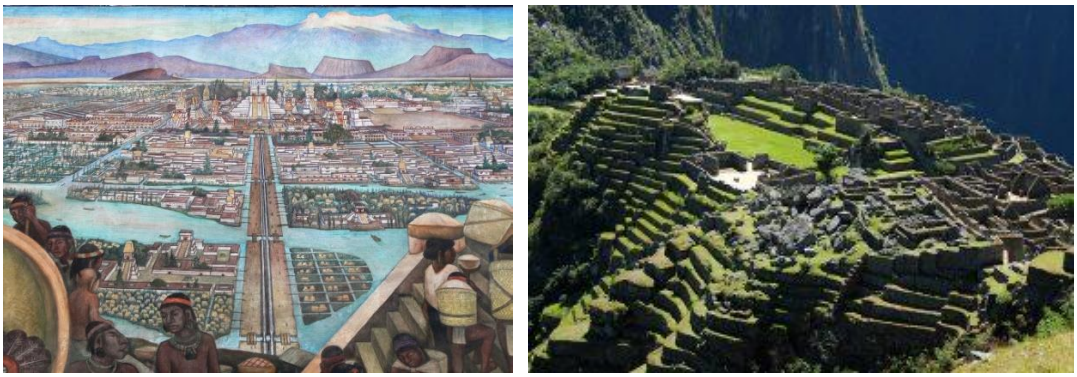


Figure 2.4. Historical Chinampas in the Aztec era (left), Machu Picchu settlement (right)
Sources: https://zif.hypotheses.org/802, https://www.happonomy.org/en/urban-farmer/

Moreover, in the Middle Ages, limited food movement due to the lack of transportation facilities and packaging system forced people to make agriculture close to their settlements. As a result of this, urban and agricultural areas coexisted spatially at those times. The king’s kitchen garden, known as “Potager du Roi,” created ornamental and allotment gardens in cities, are evidence of that. The intimate relationship between the city center and agriculture could also be seen in the Old European cities. For instance, in London, the street names in the city center where agricultural activities occurred include animal, fruit, and vegetable names. London is still one of the most diverse and productive cities for urban agriculture (Petts, 2001).

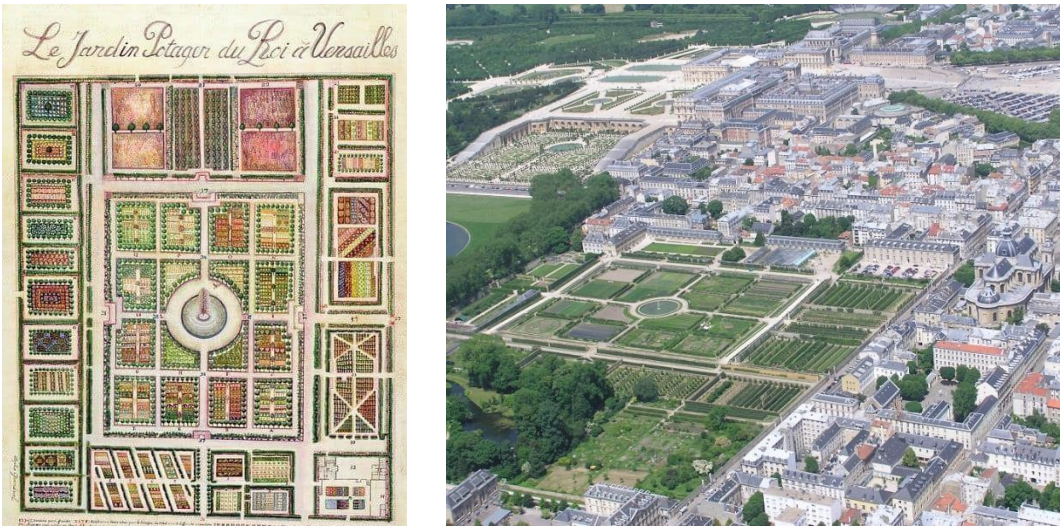


Figure 2.5. The King's Kitchen Garden in 16th Century and today.
Source:http://www.potagers-de-france.com/les-jardins/ile-de-france/yvelines/ecole-nationale-superieure-de-paysage-le-potager-du-roi

With the Industrial Revolution, urban became a place where consumption and non-agricultural activities took place. This era separated urban and agricultural activities by widening the gap between urban citizens and agriculture. People started to move away from nature and agriculture. At that time, while urban agriculture activities were losing their significance, providing food mainly depended on trade and commercial institutions.

This era brought along some problems such as rapid urbanization, immigration problems, unemployment, and unhealthy living conditions. Consequently, the "Garden City" concept was offered by Ebenezer Howard in 1898. Garden cities contain residential, industrial, and agricultural areas in balance with planned and self-sufficient communities surrounded by greenbelts (Lucey, 1973). In order to reach self-sufficient communities, food production was a significant component in the garden city concept. The aim of Howard's Garden City was to bring nature back into the city. According to Philips, the movement of integrating productive landscapes back into the city was as same as the urban agriculture movement in cities

today (2013, p.8). In that way, urban agriculture again gained its importance at that time.

In the time of World War, I & II, the importance of productivity appeared clearly. Therefore, governments actively supported urban agriculture activities during these wars by some campaigns (Hallett, Hoagland, & Toner, 2016, p.69). Victory and War Gardens Campaigns encouraged people to make agriculture by claiming "food will win the war" and "grow your own, can your own" discourse. In the U.S., the campaign produced over 9 million pounds of fruit and vegetables per year, which was 44% of U.S. grown produce at the time (Jskaife, n.d.). Hallett and et. all claim that urban agriculture evolved a necessity in that time (2016, p.70).

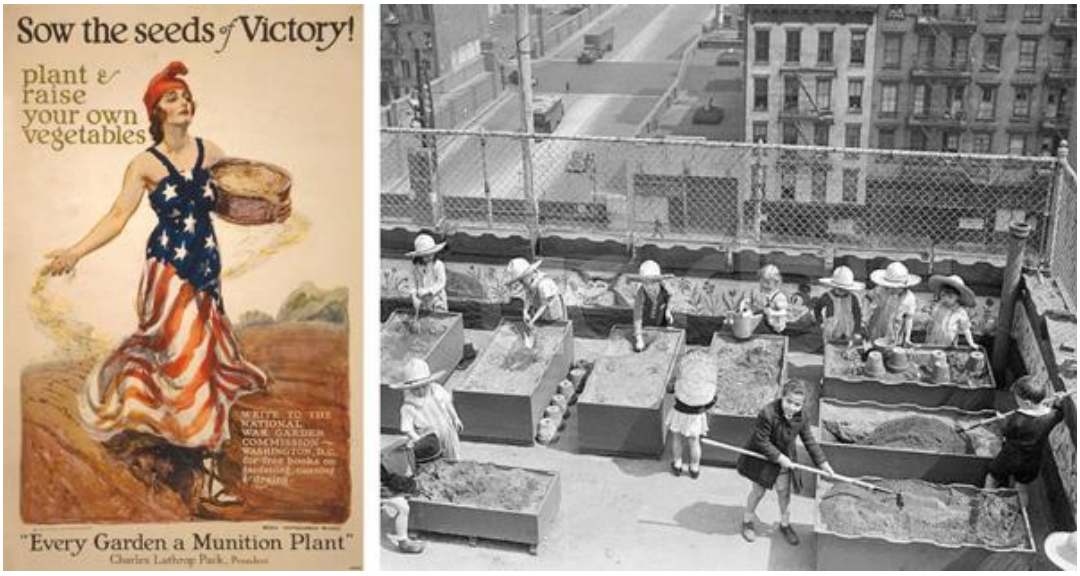


Figure 2.6. Victory Garden poster in left and rooftop farming in that time in right.
Source:https://www.hoerrschaudt.com/urban-agriculture-the-latest-trend-is-ancient/

After the war period, agriculture lost its existence in urban, and it started to be generally associated with the rural context. In the 1970s, the economic, social, and environmental crisis started to occur due to rapid urbanization, changes in the consumption patterns, damages to the environment. As a result, environmental awareness, self-sufficiency, food security became significant concerns for cities. The

concept of sustainability emerged as a result of these concerns. With these concerns and emerge of sustainable urban agriculture became a current issue again.

Moreover, awareness of the necessity of urban food production, producing the food free from chemicals and genetically modified organisms, and revitalizing the unused city spaces forced to revitalize the urban agriculture movement (Hallett et al.,2016, p.71). After that, many city farms and urban agriculture gardens started to establish in different countries. For instance, The Kentish Town City Farm was launched in 1972 in London.

In recent years, pandemic diseases also showed the importance of self-sufficiency and self-productivity that agricultural activities in an urban context can provide. Therefore, urban agriculture is developing rapidly worldwide because of having positive impacts on economic, environmental, and social areas. Evidence of raising role of urban agriculture is observable in many countries (Orsini et al., 2013). They started to use urban agriculture as a sustainable development strategy. One of the examples of these movement is “Greenest City Action Plan of Vancouver”. To complete this action plan, many sub goals were set to improve urban agriculture in city. As a result of these sub goals, many urban agriculture initiatives have been established (Walker, 2016, p.170). Also, urban agriculture activities cover more than 21.000 ha in Cagayan de Oro City, Philippines and 11.000 ha in Jakarta, Indonesia (Orsini et al., 2013).

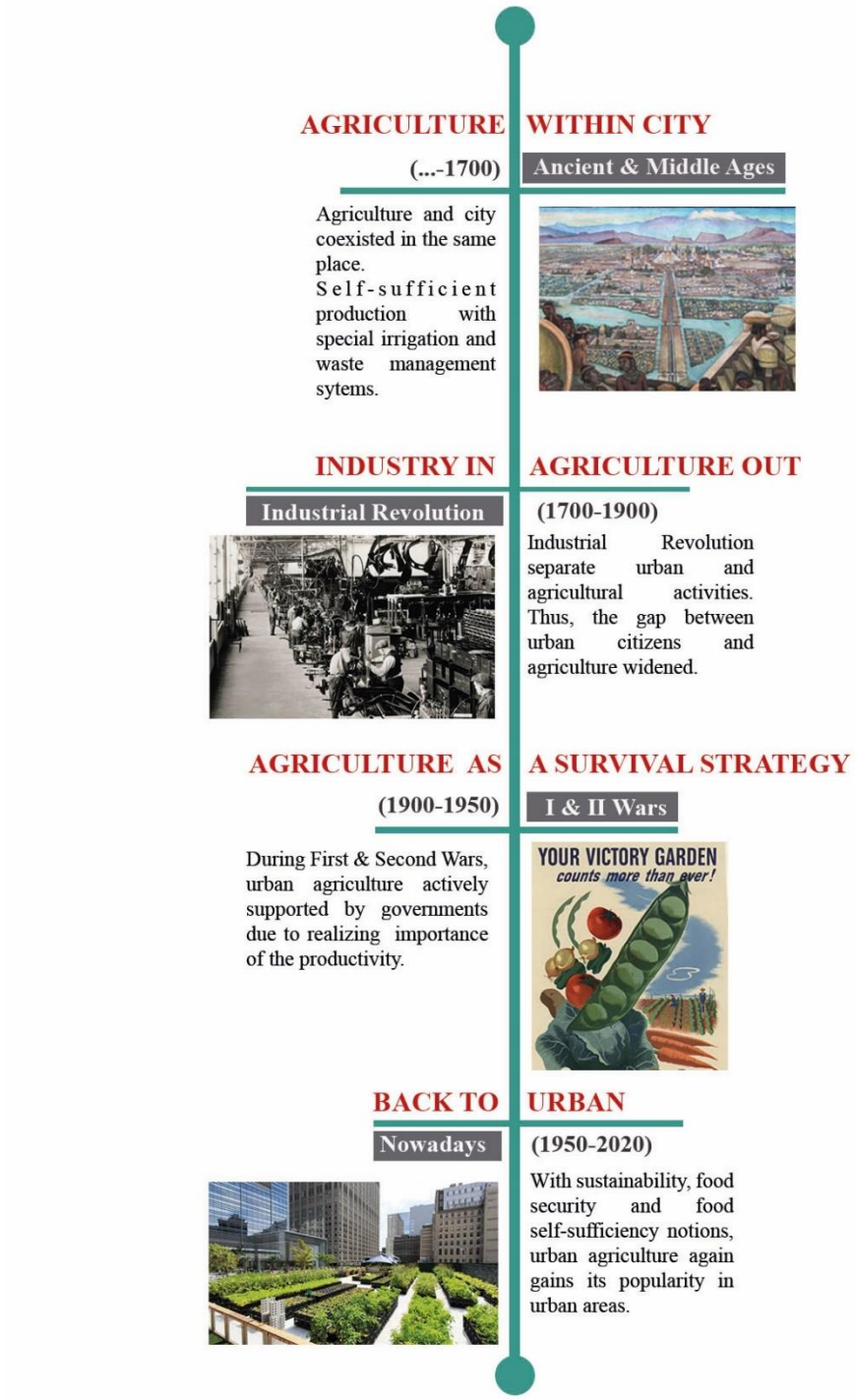


Figure 2.7. Historical Timeline of Urban Agriculture from Ancient Times to Present (Source: Personal Drawing)

2.2.2 Different Approaches of Urban Agriculture

Different authors have defined urban agriculture in different contexts; in other words, literature reviews provided many definitions, making urban agriculture challenging to define as a whole. Therefore, any research, program, or technical support regarding urban agriculture should begin with forming a context-based and specific definition of urban agriculture (Dobbins, Cox, Edgar, Graham, & Philyaw Perez, 2020). For that reason, in this part, the different approaches of urban agriculture will be handled depending on the thesis context. Firstly, the COST's classification regarding urban agriculture and what kinds of components distinguish it from other types of agriculture will be explained. This classification will be applied to the Çankaya case in the case study part later. Also, some function debates regarding the approaches of urban agriculture will mention in this part. These debates have mostly arisen from the Global South and the Global North's geographical and economic differences. Secondly, some of the selected definitions of urban agriculture will be examined. Furthermore, it will be concluded that there is a paradigm shift in the approaches of urban agriculture from economic-based activity to ecological based activity.

COST (2013) aimed to establish a common understanding of urban agriculture. For that reason, COST defined urban agriculture by asking some questions. Each questions represent some components of urban agriculture. Each components also describe the differences between urban agriculture and other types of agriculture. Not every component is essential to define urban agriculture. Some of them play a significant role, while others have little impact. They explain the characteristics of urban agriculture by asking the following seven questions.

Table 2.4 Components of urban agriculture
(Source: Adapted from COST definition)

Questions	**Components**
Where does urban agriculture take place?	Spatial
What does urban agriculture provide?	Functional
Where are the products from urban agriculture consumed?	Market-orientation
What does urban agriculture come from?	Origin
Who performs urban agriculture?	Actor
Why do someone perform urban agriculture?	Motivation
Who are the beneficiaries of urban agriculture?	Stakeholder

Most definitions of urban agriculture depend on its spatial location (COST, 2013). Urban agriculture has a strong relationship with the city; therefore, it is separated from other forms of agriculture due to its spatial component. The ***spatial*** component refers to urban agriculture's location, i.e., the proximity to the urban area and the spatial extent. According to COST (2013), the degree of proximity to the urban area has a decisive role in identifying the type of urban agriculture.

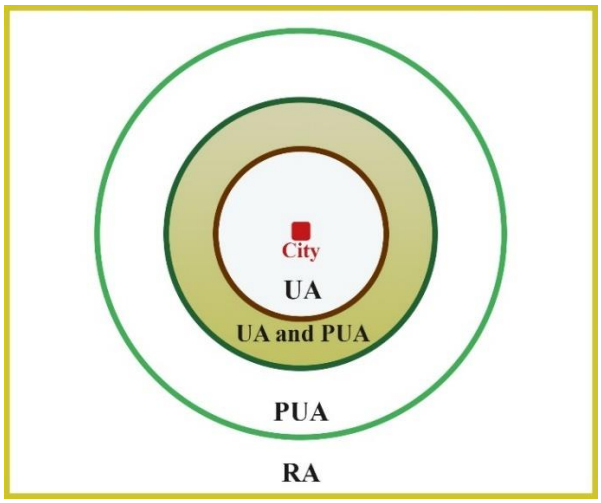


Figure 2.8. Location of urban agriculture (UA), peri-urban agriculture (PUA) and rural agriculture (RA) (Source: Adapted from Opitz, Berges, Piorr, & Krikser, 2016)

Figure 2.8 shows the different types of urban agriculture in terms of their proximity to the city center. Urban agriculture is located in the dense settle areas, where peri-urban agriculture is located in the urban fridge and periphery. Of course, rural agriculture is located outside urban areas. However, there are no absolute rigid borders that separate the locations of urban agriculture and peri-urban agriculture. Instead, there is usually an interface area (UA and PUA) between these two forms of urban agriculture, as seen in Figure 2.8 (Opitz et al., 2016, p.344). Therefore, as a spatial component, the proximity to the city center is a significant characteristic of urban agriculture (COST, 2013)

The ***functional*** component of urban agriculture varies in many ways so that urban agriculture can be defined as having a multifunctional character. The core activity of these functions is production. However, apart from production, urban agriculture is defined by a different set of functions that provide the services such as social activities, education, recreational opportunities, the urban waste treatment that do not exist as a prime aim in rural agriculture (COST,2013). These multifunctional characteristics of urban agriculture enable some conflicts to occur. These conflicts relate to whether urban agriculture is a farming or a gardening activity.

In literature, some define the function of urban agriculture as “gardening”, while others define it as “farming”. Gardening mostly refers to leisure and recreational activity conducted on a small scale by a woman’s domain. On the other hand, farming refers to production for the market with subsistence or commercial purposes that are mostly practiced on a more extensive scale than gardening. Therefore, there is significant market engagement in farming functions. Farming is considered a men domain in many parts of the World (WinklerPrins,2017, p.2). However, in practice, there is no sharp discrimination in these two terms. In contrast, there is fluidity between these two.

Table 2.5 Differences between gardening and farming functions of urban agriculture (Source: classified by author according to WinklerPrins,2017)

	As a gardening	As a farming
Dimension	Small scale	Larger scale
Aim	Connotes leisure, aesthetic, and recreation Supports social goals and community building	Connotes production for subsistence or commercial purposes
Market	No market engagement	Significant market engagement
Motivation	For own/home usage	For market production
Actor	Women domain	Men domain

Global differences also have influenced to form this conflict in the function component of urban agriculture. Functionally, the role of urban agriculture has different purposes in developed and developing countries. Its emphasis is on recreation in developed countries while food security in developing countries (Krishnan, Nandwani, Smith, & Kankarta, 2016, p.326). In detail, urban agriculture is being used as a survival strategy in the Global South. In contrast, it is being used as a recreational and time-filling activity in the Global North (WinklerPrins,2017).

Therefore, in the Global South, urban agriculture's social and economic function is more notable (Azunre, Amponsah, Peprah, Takyi, & Braimah, 2019). They operate urban agriculture to meet food security and nutritional needs (Taguchi & Santini, 2019). The main aim is providing employment and social integration and contributing to poverty reduction. For these reasons, they produce both for subsistence and the market. For instance, in Latin America and Africa, people farm in limited spaces to be able to survive. Their end goal is providing food for their families (Taguchi & Santini, 2019). In most of the developing countries in the Global South, the development of urban agriculture is one of the major strategies to deal

with urban poverty and develop the well-being of citizens (Orsini, Kahane, Nono-Womdim, & Gianquinto, 2013)

On the other hand, urban agriculture leads to a more sustainable way of life in the Global North (Taguchi & Santini, 2019). Urban agriculture activities in the Global North focus on most social and environmental benefits rather than economic ones (Azunre et al., 2019). It is seen as a way of reconnecting people and their food resources to create a social link between a community and agriculture (WinklerPrins, 2017; Taguchi & Santini, 2019). Moreover, urban agriculture is often seen as a green source for the city of Global North. For those roles, urban agriculture gains importance to ensure urban sustainability and resilience in the Global North regarding environmental and social aspects.

Table 2.6 Functional differences between Global South and Global North.
(Source: Azunre et al.,2019; WinklerPrins, 2017; Taguchi & Santini, 2019.)

Global South	Global North
• The social and economic function of urban agriculture is more notable.	• The environmental function is more notable than socio-economic function.
• Often operates urban agriculture to meet food security and nutritional needs of families.	• Often operates for social improvement and numerous environmental benefits such as urban agriculture's role in greening the city
• The main aim is providing employment and social integration, contributing to poverty reduction and being able to survive.	• The main aim is creating a way of reconnecting people and their food sources by forming a social link within a community and agriculture.
• Produces for gaining economic benefits	• Produce for leading a more sustainable and eco-friendly way of life.

To conclude, the literature review shows us that there is no common understanding or discrimination in functions of urban agriculture definition itself. It depends on the

aim of urban agriculture activities, locational differences, and local characteristics of each country.

The ***market*** component of urban agriculture has less impact on defining urban agriculture because the produced goods are distributed in a very different manner as compared to rural agriculture (COST,2013). There are more direct approaches in rural farming that they operate at the world or regional markets. On the other hand, urban agriculture mostly produces goods for the local market or household usage in many cases.

The ***origin*** component of agricultural areas in the city can be formed for many reasons. One of them can be originated from remnant areas that embedded the whole urban setting and typically remained in the city for some reasons. These reasons can be local environmental conditions or owner decisions. For intense, areas may not be suitable for development, or the owner may be reluctant to sell. The areas that leave for future urban expansion can be considered in the same way. The other is introduced areas that emerge in the city in shapes and forms. The origins of them may be unplanned or purposely designed.

Moreover, citizens may create urban agriculture areas spontaneously, or local authorities may create them deliberately. For instance, several community gardens have been planned and created by local authorities, while the guerrilla garden is originated by citizens illegally. In other words, the origin of urban agriculture areas is different. They could be planned directly or indirectly, legally, or illegally.

The ***actor*** component of urban agriculture relates to the individual human being (alone or in a group) who performs the agricultural activities. COST (2013) categorizes the actors into three groups: conventional farmers, hobby farmers, and private non-farmers. Conventional farmers usually perform agriculture activities close to the city full-time or part-time. They have agriculture knowledge. Due to the rapid urbanization process, they suddenly find themselves surrounded by urban areas. Another type of urban farmers is hobby farmers. They usually own a small farm area in the peri-urban and perform agriculture as a hobby. Conventional farmers

and hobby farmers are also found in non-urban agriculture areas. A significant distinction between these farmers from other urban agriculture actors is that they own the land or rent it legally. In the last type of urban agriculture, actors generally perform agricultural activities in areas belonging to private or public authorities such as community/municipality or housing estate company/ cooperative. They do not have an agricultural background, so they are defined as private non-farmers.

The ***motivation*** component is related to the desire behind the establishment and maintenance of urban agriculture activities. Essentially, the motivation behind urban agriculture depends on the purpose of urban agriculture. Therefore, this motivation has been changing over the years: sometimes, it is used as a survival strategy during Wars; sometimes, it is used to beautify the cities. Today, urban agriculture's strongest motivation is providing sustainable services for individuals and cities in terms of economic, environmental, and social dimensions like food security, food self-sufficiency, waste management, and social integration.

The ***stakeholder*** components of urban agriculture deal with a number of individuals, groups, and institutions that take advantage of urban agricultural activities. As it mentioned before, urban agriculture provides a broad range of services, so there are diverse stakeholders (individuals, groups, institutions) that obtain benefits from these services. These advantages may be for the entire community, such as soil protection, waste management. On the other hand, it could provide direct advantages to citizens, such as providing education, recreation, health, social integration, and food and job opportunities (COST, 2013).

These seven components are mentioned to frame and define the concept of urban agriculture by comparing it to other types of agriculture. The summary of all of these components is given in Table 2.7. It shows that unlike non-urban agriculture, urban agriculture activities occur in a location close to the city with different actors like conventional farmers, hobby farmers, and private non-farmers. Close proximity ensures the direct relationship between the city and agriculture. Functionally, these activities are made for food and non-food production, such as food security,

community empowerment, education, and recreation. Therefore, the stakeholders in these activities are food and non-food consumers. Moreover, the scope of the urban agriculture market is not as broad as in non-urban agriculture. It produces mainly for local market and personal usage. Accordingly, the motivation for urban agriculture does not only depend on production purposes. It depends on the economic, social, and environmental aspects too.

Table 2.7 Components of Urban agriculture adapted from COST, 2013

Component	**Urban Agriculture**	**Non-urban Agriculture**
Spatial	Close to city	Distant from city
Functional	Food and non-food production	Food production only
Market	Local (mainly) and personal usage	Regional, national, international
Origin	Planned or unplanned	Unplanned
Actor	Conventional farmers, hobby farmers and private non-farmers	Professional farmers (full time and part time)
Stakeholder	Food and non-food consumers	Food consumers only
Motivation	Depend on purpose, mostly economic, social, and environmental aspects	Production

The general concept of urban agriculture proves that there are also some differences in defined urban agriculture components. For instance, sometimes urban agriculture is done to the local market to obtain an economic benefit, sometimes it is for only household usage. Alternatively, sometimes, it is done by concerning social aspects. These differences enable different viewpoints on whether urban agriculture is an economic-based activity like an industry or an ecological and social-based activity. Different viewpoints lead to occur in a paradigm shift in the definitions and context of urban agriculture.

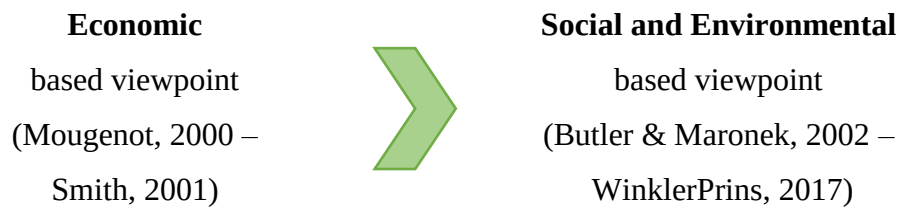


Figure 2.9. Paradigm shift in the definitions and context of urban agriculture.

In the broadest sense, urban agriculture comprises the production of food and activities of cultivating, processing, and distributing produced food in (urban) and around (peri-urban) the city (Philips, 2013, p.45). With many environmental and ecological problems today, urban agriculture has gained new meaning for creating more sustainable cities. This leads to a paradigm shift moving from only practice to gaining some economic benefit to a more sustainable practice that also provides environmental, social, and ecological benefits. Since only food production and distribution does not ensure sustainability, but when it is related to an ecological viewpoint, it does (Philips, 2013, p.47). Therefore, there is a changing viewpoint in the definition of urban agriculture.

Mougeot made the first technical definition of urban agriculture in 2000. Mougeot defines urban agriculture as:

> *"An **industry** that can be located in intra-urban or peri-urban of the cities. He claims that it grows, processes, and distributes a diversity of food and non-food products by using human and material resources, products, and services in that urban area. Moreover, it supplies these human and material resources, products, and services to that urban area (2000, p.11).*"

In this definition, urban agriculture is defined as an industry that meets the city's nutrient needs and provides only economic benefits for them. The definition does not refer to any aspects of food security and community health, or sustainable agriculture. It also does not include social aspects of the urban agriculture community improvement and integration among citizens.

After this definition, Smit et al. define urban agriculture in 2001 as:

> *"an **industry** that produces, processes, and markets food, fuel, and other outputs, largely in response to the daily demand of consumers within a town, city, or metropolis, on many types of privately and publicly held land and water bodies found throughout intra-urban and peri-urban areas. Typically, urban agriculture applies intensive production methods, frequently using and reusing natural resources and urban wastes, to yield a diverse array of land-, water-, and air-based fauna and flora, contributing to the food security, health, livelihood, and environment of the individual, household, and community (Smit et al., 2001, p.1)."*

Again, the production component of urban agriculture is in the foreground. This definition also defines urban agriculture as an industry that is a source of the city's economy by producing food. However, this one consists of some social and environmental concerns, like reusing urban wastes, contributing to food security in communities.

Unlike this, Butler and Maronek define urban agriculture, including its social, environmental, design, and recreational aspects:

> *"a multiplicity of other benefits and services (...) that include **recreation and leisure**; economic vitality and business entrepreneurship; individual health and well-being; community health and well-being; landscape beautification; and **environmental restoration and remediation** (Butler & Maronek,2002, p.6)"*

WinklerPrins' definition is also related to these aspects:

> *"Urban agriculture is a way of **reconnecting people** and their food resources, as well as the numerous **environmental benefits** such as urban agriculture's role in greening the city and contributing to urban sustainability (WinklerPrins,2017)."*

Besides the production aspects of urban agriculture, this definition mostly refers to the environmental and social aspects of sustainable urban agriculture. Philips *(2013, p.48)* claims that this definition addresses both sustainable design and economic services. Thus, planners, designers, and environmentalists should be more responsive to this definition because urban agriculture is turning from just practice for gaining an income and small food-producing activities to more sustainable practices that deal with the cities' social and environmental development (2013, p.47-48). Besides Philips, Pfeiffer et al. also claim that in many cases, urban agriculture does not focus on food production and commercial purposes but on social and ecological development (2015).

As seen above, urban agriculture has been studied by various professionals, including a wide range of disciplines. Various studies make urban agriculture a broad concept. There are several approaches in definitions of urban agriculture. Therefore, it is claimed that there is no commonly agreed definition regarding urban agriculture (Van Tuijl, Hospers, & Van Den Berg, 2018, p.7). They will continue to evolve because urban agriculture could be applied to diverse purposes and contexts (Mougeot,2005, p.2). For these reasons, forming a context-based definition is essential while studying urban agriculture.

In broader manner, urban agriculture is an industry that has activities:

- produces, processes, and distributions of food in the urban context,
- contribute to environmental and natural resources of the cities,
- ensure the contribution to economic development
- provide food security, social interaction, and education for citizens.

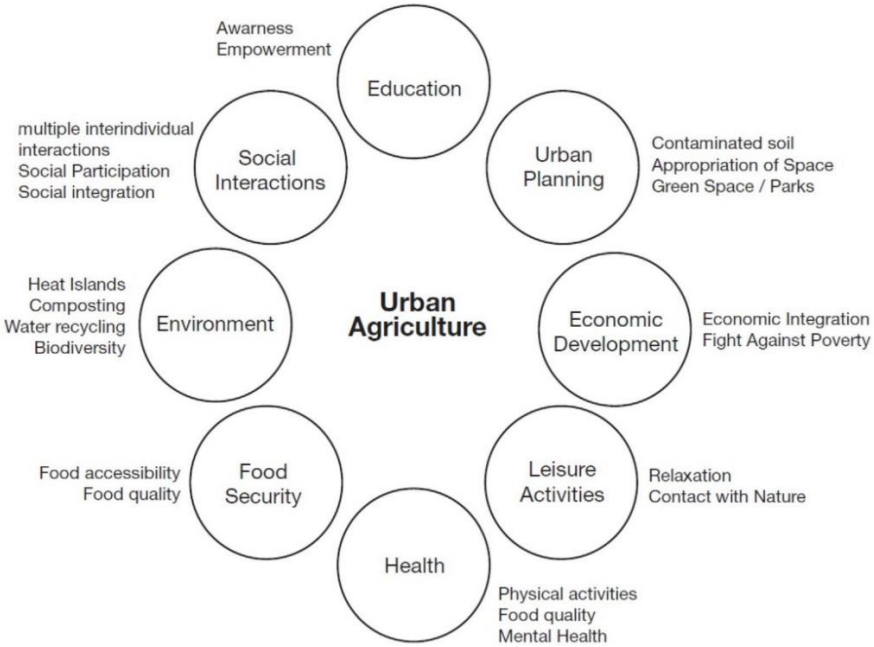


Figure 2.10. Different areas of Urban Agriculture activities related to economic, social, and environmental development (Source: Duchemin, et al., 2009, p.44)

Eventually, urban agriculture means producing foods by making cultivation activities in different urban contexts not only for economic purposes but also for social and environmental purposes. Moreover, there is a paradigm shift in the meaning of urban agriculture used for sustainability tools. Urban agriculture contributes to economic, environmental, and social issues in cities while making these activities in urban areas. Therefore, the economic, environmental, and social contributions of urban agriculture are significant for cities' sustainability. For that reason, in this thesis, the approach of urban agriculture based on its contributions of sustainability.

CHAPTER 3

SUSTAINABILITY AND URBAN AGRICULTURE

Previous chapters provided general understanding of the concepts of sustainability and urban agriculture. In this thesis, the concept of urban agriculture is dealt with in terms of its contribution to sustainable urban development. Urban agriculture is described as an interdisciplinary research area that develops many ideas for sustainability (WinklerPrins, 2017, p8). Integration of urban agriculture into the urban economic, social, and environmental system is notable. This integration can be seen in such aspects as using organic household waste for composting, using urban wastewater for watering plants, providing agricultural working areas for the urban poor, and becoming part of the urban food system (Cahya, 2016, p.96). Integration of economic, social, and environmental urban systems provide opportunities for sustainability. Although there is increasing attention to the contributions of urban agriculture to sustainability, it remains a new field to research. The contributions of urban agriculture to sustainable urban development are generally agreed in literature, but they are only meaningful when these contributions are evaluated in specific case areas (FAO, 2007, p.3).

For those reasons, defining the relationship between urban agriculture and sustainability is a significant issue. The contributions of urban agriculture to the sustainability of cities will be examined by considering the economic, environmental, and social perspectives. Therefore, firstly this chapter will discuss the relationship of urban agriculture to sustainability in global perspectives. Then a literature review of the contributions of urban agriculture to sustainability will be provided.

3.1 Urban Agriculture in Global Sustainability Perspectives

In Chapter 2.1, the concept of sustainability was explained in terms of its definition, history and dimensions. The emergence of sustainability concepts was developed via different conferences on a global scale. This chapter will examine the frequency of use of the term "urban agriculture" in these conferences. The importance of urban agriculture to urban sustainability can be observed by looking at whether the term "urban agriculture" was considered in these conferences or not. Therefore, this part examines whether the term "urban agriculture" was mentioned or emphasized in these conferences directly or indirectly. Three important conferences that mentioned urban agriculture issues were found in the sustainability timeline. These are 1992 Earth Summit, 1996 Habitat II and 2016 Habitat III.

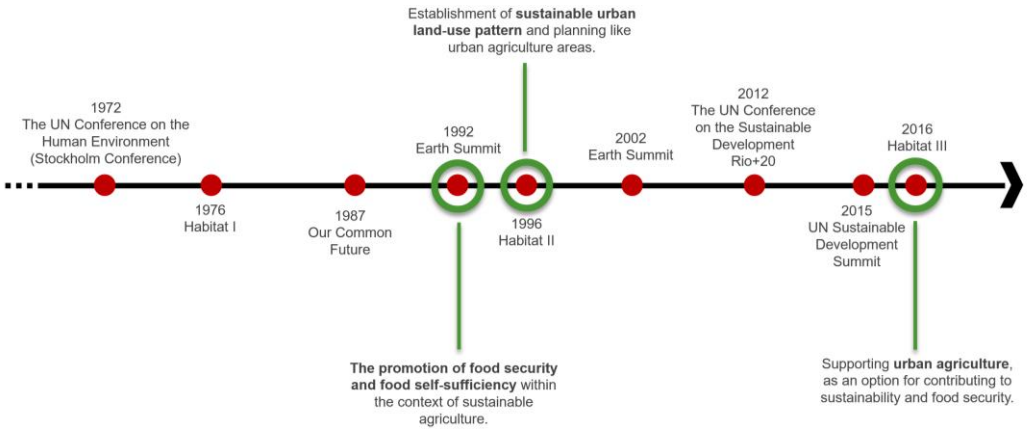


Figure 3.1. Important events for urban agriculture in global sustainability timeline. (Source: Personal Drawing)

3.1.1 Earth Summit – Agenda 21, 1992

The Earth Summit United Nations Conference regarding sustainability was held in Rio de Janeiro in 1992. One of objectives of Agenda 21 – Earth Summit, 1992 was promotion of food security and food self-sufficiency within the context of sustainable agriculture. According to this objective, Agenda consists of the chapter "Promoting Sustainable Agriculture and Rural Development". This chapter mentions

that by the year 2025, the capacity of available resources will be insufficient to satisfy the demands of the future growing population for food and other agricultural commodities (Agenda 21, 1992). Therefore, it claims that a major adjustment is required to create the conditions for sustainable agriculture and rural development. This adjustment is about the integration of sustainable development considerations with agricultural policy and planning. In short, Agenda 21 proved the importance of food security, food self-sufficiency and sustainable development in agriculture. However, the considerations are mainly about a rural context. In other words, agriculture in an urban context was not a topic of Agenda 21 in 1992. Although urban agriculture was not mentioned specifically, the objectives are related to the main issues of urban agriculture. Awareness of the importance of food security, food self-sufficiency and participation in agriculture started in Agenda 21.

3.1.2 Habitat II, 1996

Habitat II introduced the development of sustainable human settlements to the urbanizing world in 1996. It mentioned that reaching sustainable land use is essential for the provision of food, water and energy for many living systems and human activity (Habitat II, 1996, p. 57). As an action, it proposed that governments, local authorities, and other institutions "should support the efforts of human settlement to establish sustainable urban land-use pattern and planning" (Habitat II, 1996, p. 58). Their suggestions about establishing sustainable urban land use also apply to ideas about urban agricultural land use.

> *"(h) Develop and support the implementation of improved land-management practices that deal comprehensively with competing urban land requirements for housing, industry, commerce, infrastructure, transport, green spaces and forested areas, taking into account the need for spaces for everyday activities - for playgrounds, parks, sports and recreation areas and areas suitable for gardening and* ***urban agriculture;*** *(Habitat, 1996, p. 58)."*

Here, urban agricultural areas are seen as space for everyday activity; in other words, besides the food security and food self-sufficiency purposes of urban agriculture, Habitat II proposed urban agricultural space mostly for its social goals, such as providing recreational areas for citizens. Urban agriculture in the Habitat II context was especially related to provision of sustainable land-use areas. Actually, urban agriculture was still not a main aim for cities, it was considered as a means to provide sustainable urban land use. Nevertheless, urban agriculture was mentioned as a sustainable urban land-use in Habitat II, and this shows that urban agriculture was becoming a significant component to ensure sustainability in cities.

3.1.3 Habitat III, 2016

Habitat III is the first conference that directly supports the term "urban agriculture." In the "Planning and Managing Urban Spatial Development" part of the conference's report, the term "urban agriculture" is mentioned as:

> *"…We will also support* ***urban agriculture and farming****, as well as responsible, local and sustainable consumption and production, and social interactions, through enabling and accessible networks of local markets and commerce as an option for contributing to sustainability and food security." (Habitat III, 2016, p. 24)*

Here, urban agriculture was handled in a more comprehensive way than the other conferences. Urban agriculture was supported by Habitat III because it was seen as an option for contributing to sustainability in many ways, from consumption and production patterns to social interactions among society. It is understood that there is an awareness of the importance of the mutual relationship between urban agriculture and sustainability.

After Habitat III, some initiatives related to urban agriculture started to be established, such as Urban-Rural Linkages and Edible City initiatives. This demonstrated that urban agriculture was then effectively on the cities' sustainability

agenda. Therefore, investigating the economic, social, and environmental contributions of urban agriculture to sustainability and concrete initiatives regarding this issue was gaining importance.

3.2 Contributions of Urban Agriculture to Sustainability

As mentioned in the previous section, awareness of the importance of urban agriculture to sustainability started to rise thanks to the conferences in global perspectives. Not only in the agenda of global conferences, but urban agriculture is also on the agenda of city policies in recent years. As a result of this, many cities have encouraged the urban agricultural activities as a tool for ensuring urban sustainable development. For instance, there is a strong consensus between politicians and academics that urban agriculture is a significant way of contributing to urban sustainability in Australia (Sarker, Bornman, & Marinova, 2019). Consequently, many studies dealt with the relationship between sustainability and urban agriculture.

Literature review shows us that there is a strong relationship between sustainability and urban agriculture. Many studies support the idea that urban agriculture is a tool for sustainable development in cities (Pearson et al.,2010). For instance, Vásquez-Moreno and Córdova claim that cities' roles are turned from predominantly consumptive into a role that includes the provision of multiple services and resources. According to their article, urban agriculture is one mechanism for facilitating this change, because it enables people to produce some services and resources inside the city area where they are highly consumed (2013, p. 200). Moreover, WinklerPrins (2017) claims that urban agriculture is a tool for reconnecting people and their food resources, as well as providing numerous environmental benefits such as urban agriculture's role in greening the city and contributing to urban sustainability.

In fact, the benefits originating from urban agriculture activities relate to the economic, social and environmental development of the cities. This proves that urban agriculture activities directly contribute to the three pillars of sustainability (Deelstra & Girardet, 2000, p. 46; Azunre et al., p.104). The three main principles of sustainability that urban agriculture integrates are "**economic profitability**, **social wellness** and **environmental health**" (Krishnan et al., 2016, p.327) Therefore, it is worth answering the question: to what extent does urban agriculture contribute to sustainability in terms of these three principles? For that purpose, thirteen articles revealing the contributions of urban agriculture to sustainability were analyzed, and it was observed that contributions in terms of economic, social, and environmental aspects make some clusters in those articles. These contributions were categorized in terms of the three pillars of sustainability and were arranged in such themes to clarify the relationship between urban agriculture and sustainability. These themes will help to form sustainability assessment indicators of urban agriculture in next section.

3.2.1 Economic Contribution

Income, savings, expenses, employment generation, and market development are main considerations in the economic dimension of sustainability (Vásquez-Moreno & Córdova, 2013, p.205). In terms of urban agriculture, there are two considerations relating to economic sustainability: its economic viability and its economic impacts in the citizens and city (Hallett et al., 2016, p.90). Therefore, the main contributions of urban agriculture to economic sustainability could be handled in such themes as: ***income & employment, savings & cost reduction, and innovation, research, & enterprise development.***

The first theme in economic contribution is ***income & employment***. Most of the literature claims that employment generation and contributing to household income are the main benefits of urban agriculture in terms of the economic aspects. Urban agriculture provides the employment areas for citizens especially for the urban poor,

and it constitutes another way of generating income (Dölekoğlu & Gün, 2017; Vásquez-Moreno & Córdova, 2013; Van Tuijl et al., 2018; Krishnan et al., 2016). Table 3.1 shows the impact of urban agriculture on employment and income generation in different countries. For example, urban agriculture is the second largest source of urban employment in Dar es Salaam, Tanzania; 20% of working-age adults participate in urban agriculture and 15-20% of all families in the city have a home garden. Also, urban agriculture activities are an alternative way to provide or contribute to household income directly or indirectly. Because it generates employment, it is a primary source of income especially for many urban poor people in several countries (Dölekoğlu & Gün, 2017). For instance, Detroit and New York give thousands of acres of land to unemployed workers to grow food and obtain income (Deelstra & Girardet, 2000). Besides that, selling the excess production of urban agriculture provides a secondary source of income (Dölekoğlu & Gün, 2017; Vásquez-Moreno & Córdova, 2013). According to a survey conducted by FAO, people gain direct sufficient income from urban agriculture activity in 16 of the 23 countries surveyed (FAO,1996; FAO,2014). Moreover, data from another survey of fifteen countries conducted by Zezza and Tasciotti shows that the share of urban households that earn income from agriculture vary from 11% in Indonesia to almost 70% in Vietnam and Nicaragua (Zezza & Tasciotti, 2010, p.267).

Table 3.1 Contribution of urban agriculture to employment (Source: Smit, Nasr, & Ratta, 2001)

Country	Impact
Africa	
Tanzania	In Dar es Salaam, urban agriculture was the second largest employer in 1988 (petty trading and labor were first). Twenty percent of working-age adults participate in urban agriculture.
Zambia	In a program to expand and improve food gardens in Matete, the average annual income of participants nearly doubled in two years.
Asia	
India	Intensive farming on 800 hectares of garbage dumps in Calcutta employs about 20,000. Fisheries in sewage-fed lagoons employ 4,000 fishermen families and produce 6,000 tons of fish every year.
Thailand	In Bangkok, a poultry conglomerate contracts to approximately 10,000 outgrowers.
Latin America	
Argentina	In Buenos Aires, backyard gardens can provide 10-30 percent of the cost of a nutritious diet.
Colombia	Urban hydroponics supported by UNDP generates approximately US$ 30 per month on 10 square meters and requires only 1 hour of daily care. Up to 2 monthly minimum salaries (US$ 90-180) can be made on 30-60 square meters of planting.

Additional contributions of urban agriculture to the theme of income and employment are development and diversification of the local economy and strengthening local economic linkages by creating opportunities for local business development (Nogeire-McRae et al., 2018; Krishnan et al., 2016). These provide alternative markets not only for food but also for various local resources and inputs, such as the sale of organic wastes, the purchase of materials for supporting structures and containers, and services for urban agriculture (Vásquez-Moreno & Córdova, 2013, p.213).

The second theme related to economic sustainability is ***savings & cost reduction***. This theme could be observed in two ways: city level (macro-scale) and household level (micro-scale). Urban agriculture activities which occur on the macro scale affect savings and costs at the city level. These activities enable food to be produced in close proximity to consumers (Knapp, Veen, Renting, Wiskerke, & Groot, 2016). When production is located in close proximity to consumption, the food supply chain becomes shorter (Sarker et al., 2019) so the distance the food travels is reduced. Therefore, one of the cost reduction benefits of urban agriculture is reducing the travel cost and time by reducing the distance food travels at the city level (Hallett et al.,2016; Vásquez-Moreno & Córdova, 2013; Dölekoğlu & Gün, 2017; Krishnan et al., 2016; Azunre et al., 2019). Reduction of travel distance indirectly affects other aspects of sustainability such as reducing greenhouse gas emissions and air pollution

(Dölekoğlu & Gün, 2017; Hallett et al.,2016). Another issue regarding savings and cost reduction is related to reduction of household food expenses through food production at the household level (Nogeire-McRae et al., 2018; Sarker et al., 2019). In other words, urban agriculture provides partial household savings through food self-sufficiency (Vásquez-Moreno & Córdova, 2013, p.213). Urban agriculture producers are able to grow their own food, so they save money on their food expenses, especially in slum areas (Orsini et al., 2013). For instance, urban farmers consume almost a quarter of the vegetables they produce in Yaounde in Cameroon, so they are able to save some amount of their income (Azunre et al., 2019). Smit et al. claim that households who practiced urban agriculture in cities saved approximately 10-15% of food costs in Zambia (Smit et al., 2001, p.2).

The last theme in economic sustainability is ***innovation, research & enterprise development.*** Urban agriculture contributes to innovation, research and knowledge development in several ways (Van Tuijl et al., 2018). For example, organic growing techniques in urban agriculture require innovative scientific research (Deelstra & Girardet, 2000). This enables development of new products and markets. Moreover, urban agriculture is important to encourage entrepreneurship and the formation of new businesses (Van Tuijl et al., 2018). People tend to establish organic food production firms after learning key points about organic production by engaging in urban agriculture activities.

To conclude, the role of urban agriculture in a sustainable economy is providing income and employment, savings and cost reduction, and innovation and enterprise development, so its role in the economic contribution is clear, due to providing benefits to communities (Hallett et al.,2016, p.93)

3.2.2 Social Contribution

Urban agriculture has received significant attention from many city professionals as a way to improve urban areas with connection to broader social issues (Nogeire-

McRae et al., 2018, p.750). Because urban agriculture is related to those social issues, it plays a direct and indirect role in various social aspects and citizens' quality of life (Duchemin, Wegmuller, & Legault, 2009, p.43). According to a literature review, the social contribution of urban agriculture can be categorized into ***connection & interaction, food security & health, recreation, education & awareness, and community building & empowerment*** themes.

The first theme is related to issues of ***connection & interaction*** in the social space. Urban agriculture provides a better connection and interaction space in the community. It is seen as an important tool for the integration of different social groups such as disadvantaged people, immigrants, unemployed people, elders, and disabled people by facilitating and promoting their participation in a certain social space (Dölekoğlu & Gün, 2017). These different social groups engage with the same purpose, so their interaction is increased, and this fosters civic engagement in different social groups (Nogeire-McRae et al., 2018). Besides improving connection between social groups, urban agriculture activities also strengthen connection between society and nature. Urban agriculture areas are the only areas where people could practice agriculture inside the city. Therefore, it shortens the distance between people and nature and provides closeness, interaction, and connection of society to nature in city life (Dölekoğlu & Gün, 2017). Moreover, in the processes of connecting people to people and people to nature, much local knowledge and many traditional practices have been shared. Therefore, another connection and interaction benefit of urban agriculture is connection to traditional practices and local knowledge (Vásquez-Moreno & Córdova, 2013).

The second theme of social contribution is ***food security & health.*** The popularity of the idea that urban agriculture activities are a potential solution to food security and citizens' health is increasing day by day (Dobbins et al., 2020). Economic crises, increased costs of foods, and a need to reduce food expenditures at the household level influence the popularity of urban agriculture (Reynolds, 2011). Citizen's self-sufficiency in food production is improved by urban agriculture activities. Urban agriculture provides easy access to healthy and fresh foods for citizens, so it is an

important element for food security (Van Tuijl et al., 2018; Vásquez-Moreno & Córdova, 2013). Moreover, urban agriculture improves the overall well-being of citizens in several ways (Krishnan et al., 2016; Dölekoğlu & Gün, 2017; Azunre et al., 2019). Easier access to safe and healthy foods helps to improve the health conditions of citizens, especially the urban poor. According to research that assessed how engagement in urban agriculture impacts health, participation in farming activities enable urban households to consume healthier and nutritious foods (Orsini et al., 2013; Dölekoğlu & Gün, 2017). Besides improving citizens' nutritional health, urban agriculture helps to increase their physical activity and change mental health positively (Knapp et al., 2016).

The third theme is related to the ***recreation, education & awareness*** role of urban agriculture. Literature review shows that the idea that urban agriculture plays a significant role in recreational and educational activities is quite strong. Many authors claim that urban agriculture provides recreational activities, promotes food education, and increases awareness of food production (Dölekoğlu & Gün, 2017; Sarker et al., 2019; Orsini et al., 2013; Hallett et al.,2016; Knapp et al., 2016; Krishnan et al., 2016).

First, urban agriculture has the potential to offer recreational activities, generate aesthetic value, and attract tourists (Van Tuijl et al., 2018; Vásquez-Moreno & Córdova, 2013; Sarker et al., 2019). Urban agriculture areas provide a recreational place where citizens can come together and spend productive time. For instance, hobby farming areas were created to improve recreation in Russia in the early 20th century (Azunre et al., 2019, p.112). Also, the World Bank (2013) proposed that countries should consider the integration of urban agriculture with urban greening to improving recreation and aesthetic value (Clerino & Fargue-Lelièvre, 2020).

Promoting education and awareness is another social contribution of urban agriculture (Sarker et al., 2019; Nogeire-McRae et al., 2018). It helps people to improve their personal skills by offering environmental education and raising awareness. Urban agriculture increases the knowledge and awareness of society

about natural processes of food production by educational activities such as workshops, courses and so on. The perception of society in cities regarding food production could be changed by urban agriculture because these activities educate people about natural processes of the way food is grown, processed, and distributed (Van Tuijl et al., 2018; Deelstra & Girardet, 2000; Vásquez-Moreno & Córdova, 2013). Nogeire-McRae et al. claim that growing food in urban areas is positively correlated with raising awareness of food production (Nogeire-McRae et al., 2018). Awareness raising enables people to decide more consciously about their food system (Azunre et al., 2019, p. 111). Besides, urban agriculture also helps not to lose the traditional knowledge and practices and to transfer this knowledge between people. People learn traditional know-how of food production and so transferring of knowledge between generations could be possible (Dölekoğlu & Gün, 2017; Orsini et al., 2013). According to Hallett et al. urban agriculture could save lost generational knowledge and increase intergenerational knowledge by connecting people to their food production (Hallett et al.,2016). For instance, farmers who participated in urban agriculture research activities of World Health Organization have transferred learned knowledge to their colleague who did not participate these activities (Azunre et al., 2019).

The last theme of social contribution is ***community building & empowerment.*** Urban agriculture activities provide community development and empowerment by improving social interaction and cohesion between different social groups (Van Tuijl et al., 2018; Vásquez-Moreno & Córdova, 2013; Krishnan et al., 2016). Providing social diversity, gender equity, social inclusion and social engagement are main roles of urban agriculture in terms of social sustainability (Vásquez-Moreno & Córdova, 2013). Orsini et al. (2013) claim that urban agriculture enables 65% of women urban farmers to improve their social engagement and reduce gender inequalities in society. Also, according to research conducted by Armstrong (2000), people who engaged in community gardens showed increased social involvement in other areas.

To sum up, the social contributions of urban agriculture to sustainability have wide range of issues from providing connection, interaction, community building, empowerment among society to enabling the food security and health of community.

3.2.3 Environmental Contribution

The environmental dimension of sustainability generally refers to natural and ecological factors. The quality of air, water and soil, and the usage and management of natural resources are some main considerations in terms of environmental sustainability (Nurse, 2006). Urban agriculture generally is engaged with an organic production system that includes environmentally friendly production, avoidance of agrochemicals, and use of organic compost produced by household wastes (Vásquez-Moreno & Córdova, 2013). Literature shows that urban agriculture has many benefits regarding creation of improved microclimate, conservation of air, soil, and water, minimizing the waste in cities, promoting reuse & recycling and waste management (Deelstra & Girardet, 2000). With these features, urban agriculture has a mutual relationship with and impact on humans and the environment (Vásquez-Moreno & Córdova, 2013). Therefore, the environmental contributions of urban agriculture can be classified into these themes: ***reduction of pollution & waste management, resource efficiency, promoting green areas and biodiversity & climate change.***

The first theme is ***reduction of pollution & waste management***. Literature review shows that the most notable role of urban agriculture in environmental sustainability is reduction of pollution and contributing to waste management. Urban agriculture helps to reduce pollution by cleaning up the air, water, and soil and so it contributes to the sustainability of the environment (Van Tuijl et al., 2018; Krishnan et al., 2016). Orsini et al. (2013) suggest that urban agriculture contributes to prevention of pollution by reducing emissions produced by transportation, packaging, and storage, as production areas become closer to the consumers (Orsini et al., 2013; Deelstra & Girardet, 2000). Reducing food transportation also enables reduction of energy usage

and greenhouse gas emissions, thereby preventing air pollution. Urban agriculture promotes clean production with little or non-use of agrochemicals, which prevents soil and water pollution in cities (Vásquez-Moreno & Córdova, 2013). Moreover, urban agriculture prevents pollution by promoting waste management and recycling. Recycling urban household wastes, grey water and rainwater are some of the generally cited environmental benefits of urban agriculture (Hallett et al.,2016; Sarker et al., 2019; Nogeire-McRae et al., 2018; Vásquez-Moreno & Córdova, 2013). Waste recycling in urban agriculture helps to keep the environment clean and promote production of fresh food (Orsini et al., 2013). Usage of organic and household wastes as a compost is most mentioned in the relationship between urban agriculture and waste management, (Deelstra & Girardet, 2000; Krishnan et al., 2016; Vásquez-Moreno & Córdova, 2013) since it enables use of urban organic wastes in a productive way. For instance, turning urban organic wastes into fertilizer and using it as compost in urban agriculture provides both waste management and production of organic food for citizens. Similarly, using organic wastes, wastewater and rainwater in urban agriculture production prevents pollution and contributes to the circular metabolism of nutrients (Dölekoğlu & Gün, 2017; Vásquez-Moreno & Córdova, 2013).

Another theme is ***resource efficiency***. FAO (2010) claims that urban agriculture uses recycled water and organic wastes, so its benefits include both effectively managing natural resources and reaching sustainable environment. As mentioned in the previous theme, urban agriculture reduces food transportation, storage and packaging time, so it provides energy reduction and resource efficiency (Van Tuijl et al., 2018). Moreover, the use of recycled wastewater in food production in cities also significantly improves the efficiency of water resources (Deelstra & Girardet, 2000). Urban agriculture provides resource efficiency by recycling inorganic and construction wastes. For instance, in many cases, used bottles and glasses, old doors and roofs are used as seedbeds and crop containers (Vásquez-Moreno & Córdova, 2013). The Figure 3.2 shows recycled metal pipe used as stakes for tomatoes. Another benefit of resource efficiency is related to conservation of local seeds. In

most examples of urban agriculture protection and production of local seeds is important, such as in San Cristobal, Spain, where fruit trees are cultivated from the original ones in the Spanish colonization (Vásquez-Moreno & Córdova, 2013, p210).

Figure 3.2. The recycled metal pipe used as stakes for tomatoes, and plastic pipe used for production of strawberries (Source: Personal Archive, Çankaya Municipality)

The third theme in terms of environmental sustainability is ***promoting green areas***. Urban agriculture is seen as a tool for creation and maintenance of green spaces, greenbelts and buffer zones within cities (Van Tuijl et al., 2018; Vásquez-Moreno & Córdova, 2013). Reserving areas for urban agriculture expands the green areas in cities (Dölekoğlu & Gün, 2017). According to Orsini et al. (2013), the expansion of green areas in cities helps their microclimate and maintains their biodiversity. Sarket et al. (2019) support that idea and claim that urban agriculture improves the cities' environments by providing more green space.

The last theme according to environmental sustainability is related to ***biodiversity & climate change.*** According to Krishnan et al. (2016) urban agriculture activities have many benefits for biodiversity and climate change. Urban agriculture could be offered as an important strategy to decrease negative effects of climate change in cities (Dubbeling, 2014, p.7) Previously mentioned issues like reducing transportation distance, saving fuel, reducing carbon dioxide and other air pollution emission play a significant role in reducing the heat island effect. Besides reducing

the heat island effect and improving microclimates, it also increases ecosystem resilience and protects biodiversity of urban areas. Urban agriculture areas increase and improve the habitat inside the city, so it could contribute to conservation of biological and crop diversity (Nogeire-McRae et al., 2018). For instance, in the Philippines, the urban agriculture program as a part of the "Greening Project" aims to improve biodiversity by increasing the production of fruit tree seedlings. Moreover, thanks to biological features of plants, green spaces could decrease temperature, increase humidity, and capture dust and polluted gases from air around apartment blocks. These features help improve the climate of city areas and create microclimate areas. For instance, the municipality of Sofia has improved their microclimate by allowing food to be grown around apartment blocks, along riverbanks, and in other vacant spaces (Deelstra & Girardet, 2000; Vásquez-Moreno & Córdova, 2013).

Table 3.2 Contribution themes of Urban Agriculture

SUB-QUESTION 1

What are the contributions of urban agriculture activities in economic, social, and environmental dimensions of sustainability?

CONTRIBUTION OF URBAN AGRICULTURE TO SUSTAINABILITY			
	Economic	**Social**	**Environmental**
THEMES	• income & employment • savings & cost reduction • innovation & research & enterprise development	• connection & interaction • food security & health • recreation & education & awareness • community building & empowerment	• reduction of pollution & waste management • resource efficiency • promoting green areas • biodiversity & climate change

So far, Section 3.2 dealt with answering the Sub-Question 1: **"What are the contributions of urban agriculture activities in economic, social, and**

environmental dimensions of sustainability?" Table 3.2 shows all of the contribution themes of urban agriculture to economic, social, and environmental dimensions of sustainability. These themes are created as a result of a comprehensive documentary analysis. Related topics that demonstrate the contribution of urban agriculture to sustainability in each article were grouped and then coded in a set of themes. It is clear that all of these themes contribute to the present concerns of sustainability. However, the important thing is identifying the assessment criteria of each theme to clarify the relationship between urban agriculture and sustainability. Therefore, the next part will analyze current assessment frameworks of sustainability of urban agriculture and identify their indicator set used in assessment. Then, contribution themes and assessment indicators are combined and conclude with the indicator set of thesis to assess urban agriculture activities.

3.3 Sustainability Assessment of Urban Agriculture

The literature indicates that urban agriculture contributes to the economic, social, and environmental sustainability of a city (Azunre et al.,2019; Van Tuijl et al., 2018;). There are several different perspectives on the contribution of urban agriculture to urban sustainability. Different authors define it in light of their point of view and in different city contexts. Section 3.2 mentioned these contributions of urban agriculture in a group of themes analyzed by different points of view.

However, the number of studies that assess these contributions of urban agriculture regarding social, economic and environmental dimensions of sustainability are still somewhat insufficient (Feola, Sahakian, Binder, 2020). This insufficiency leads to the role of urban agriculture in urban sustainability remaining unresolved (Azunre, 2019, p.104). The lack of studies regarding assessment of urban agriculture's contributions to sustainability leads to difficulties in measuring the present value of the economic, social and environmental contributions of urban agriculture. This obstructs understanding of the importance of urban agriculture in sustainability. Therefore, clarifying the urban agriculture assessment indicators in the sustainable

city discourse is significant. For those reasons, in the context of urban agriculture, an important question is how to assess the sustainability contribution of urban agriculture activities.

This part reviews the five existing studies that include sustainability assessment frameworks for urban agriculture. The frameworks that assess the contribution of urban agriculture to sustainability are Vasquez-Moreno& Cordova, 2013; Azunre & Amponsah & Peprah & Takyi & Braidmah, 2019; Dielemen, 2017; Foeken, Sofer & Mlozi, 2004, and Clerino &Fargue-Lelièvre, 2018. These frameworks will be summarized in terms of their indicators, research methods, dimensions of sustainability and methods of analysis. After reviewing these studies, the set of indicators for this thesis was created.

Table 3.3 Different assessment frameworks of sustainability of urban agriculture

Framework	**Research Method**	**Dimensions of Sustainability**	**Case Study**	**Analyze Method**
Larissa Vasquez-Moreno & Ana Cordova	Field research In-dept interviews of 24 urban agriculture case Observation and interview instruments	Environmental Economic Social Cultural	San Cristobal de Las Casas, Mexico	Qualitative Analysis, Case Study
Gideon Abagna Azunre & Owusu Amponsah & Charles Peprah & Stephen Appiah Takyi & Imoro Braidmah	Reviewing the 189 articles / reports / books	Economic Social Environmental	-	-

Table 3.4 (cont'd)

Framework	Research Method	Dimensions of Sustainability	Case Study	Analyze Method
Hans Dielemen	Literature research Interviews Site visits Student Research	Food Production Economic Ecological Social Symbolic	Mexico City	Case Study
Dick Foeken Michael Sofer Malongo Mlozi	Survey Questionnaire In-depth survey Interviews Master Thesis	Employment creation The marketing of produce The legal and policy setting	Morogoro and Mbeya, Tanzania	Case Study
Paola Clerino, Agnès Fargue-Lelièvre	Focus Group Online Surveys Interviews	Agro-Environmental Criteria Socio-Territorial Economic	France	Participa-tory Approach

When looking at current studies regarding the sustainability assessment indicators of urban agriculture, it is observed that there is a relationship between the themes and the assessment indicators. However, creating an indicator framework for sustainability assessment of urban agriculture differs from context to context. For instance, FAO (2007, p.27) mentioned that *"Sustainability of urban agriculture basically implies its ability to continue in the future and operate at the current or increased levels. In order to be sustainable, urban agriculture should be profitable and economically viable, environmentally sound, socially just and culturally acceptable."* Thus, their report (2007, p.54) provides sustainability indicators that

are commonly used in analyzing studies on urban agriculture in Table 3.5. This table demonstrates that indicators for assessing urban agriculture sustainability are related to many dimensions of sustainability from environmental protection to economic viability. In other words, creating an indicator framework for sustainability assessment of urban agriculture differs by context. However, FAO claims that basically an urban sustainability assessment should consist of economic, social, and environmental indicators. Therefore, the final indicator set of thesis includes indicators related to economic, social, and environmental dimensions of sustainability.

Table 3.5 Sustainable indicators used in different studies on urban agriculture
Source: Based on Danso et al.,2003

Indicators/criteria	Examples of studies
Productivity	Asia: Yeung (1986); Nairobi: Dennery (1996)
Land security	Kumasi and Accra: Flynn-Dapaah (2002); Drechsel et al. (1999)
Protection of environment and people	Manila: Angeles (2002); Bangkok: Burleigh and Blake (2001),
Economic viability	General : Smit et al. (1996, 2000); UAM, no. 1. 2, and 7: various articles. Moustier and Danso, (2006)
Acceptability (social, political)	Accra: Obosu-Mensah (2002); Harare: Mushamba (2002); West-Africa: Flynn-Dapaah (2002); North America: Kaufman and Bailkey (2000)
Ability to form cooperatives	Harare: Mushamba (2002); Manila: Angeles (2002)
Combined indicators, SWOT	Cape Town: Small (2002); General: Streiffeler (1987); Ouagadougou Gerstl (2001)

3.3.1 Vasquez-Moreno & Cordova Framework

A study conducted by Vasquez – Moreno & Cordova aimed to develop a conceptual framework to assess the contributions of urban agriculture to urban sustainability. They defined variables and indicators to characterize the sustainability of urban agriculture practices. The study measured the contributions of urban agriculture to urban sustainability in San Cristobal, Mexico by using the qualitative analysis. The study focused only the intra-urban area by leaving out peri-urban and suburban practices of urban agriculture.

The methodology steps of the study were:

- providing general background on urban agriculture,
- summarizing conceptualizations of urban sustainability,
- developing a conceptual framework that describes the contributions of urban agriculture to urban sustainability,
- testing the developed conceptual framework in a case city of San Cristobal, Mexico.

To provide general information and discover practitioners and experiences, the initial identification of experiences and key informants was performed with snowball sampling, excursions to case areas and aerial photography. After that, they developed a typology for sampling and 24 practitioners were selected for the in-depth interviews. Field results were analyzed, and they were compared with the urban agriculture experiences in the literature. At the end, they developed a conceptual assessment framework that included the final set of indicators to measure the contributions of urban agriculture to the four dimensions of the sustainability: economic, environmental, social, and cultural.

Then, this conceptual assessment framework was applied to urban agriculture practices in San Cristobal de Las Casas in Mexico. They analyzed the case study practice with the four chosen dimensions of sustainability which were environmental, economic, social and cultural. They provided indicator sets according to these four dimensions of sustainability. Qualitative analyses of the obtained data were conducted through coding and a category system to understand the contribution of urban agriculture to urban sustainability in the case area.

At the end of the analyses, the economic assessment of urban agriculture was classified according to the themes of diversification of the local economy, primary source of income, partial savings through self-sufficiency of certain foods, secondary source of income, generation of a value chain, use of local inputs, time and other investments.

The environmental assessment of urban agriculture was classified by the themes of: compost production and use, recycling of inorganic and construction waste, crop diversity, local germplasm conservation, organic production systems, promotion and maintenance of green areas in the built environment, environmental services, crop irrigation, and environmental education (Vasquez – Moreno & Cordova, 2013, pp.210-212).

The social assessment of urban agriculture was classified by the themes of: formal education, non-formal education, development of skill and practical knowledge, partial autonomy from the conventional food system, family involvement, community organization, and mutual aid among city inhabitants.

The cultural assessment of urban agriculture was classified by the themes of: use of medicinal species and species for ritual use, utilization of popular knowledge for planting, growing of species from the place of origin of the urban farmer, and the search for congruence between beliefs and actions.

The summary of the research and analysis methods, and the set of indicators for each dimension of sustainability in this assessment framework are seen in Table 3.6.

Table 3.6 Vasquez – Moreno & Cordova's Framework

Research Method	Dimensions	Indicators	Analyze Method
• Field research • In-depth interviews of 24 urban agriculture case • Observation and interview instruments	Economic Dimension	• Harvest composition, volume, losses • Seasonality of production • Surplus volumes and destinations • Costs (including employees), income obtained (primary/secondary), investments • Scale of production, factors promoting or hindering scale increases	• Qualitative analysis through coding and category system
	Social Dimension	• The number of people benefitted • Whether it provided food security and/or food quality • The nature and interactions with others through urban agriculture	
	Environmental dimension	• Crop diversity • Crop rotation and soil management • Waste management • Water sources • Organic production • Types/use of agrochemicals • Knowledge of alternative /traditional agricultural practices/inputs.	
	Cultural Dimension	• The use of traditional/indigenous knowledge • The use of native/indigenous species • Sources of seeds	

3.3.2 Azunre & Amponsah & Peprah & Takyi & Braidmah Framework

This framework tried to clarify the role of urban agriculture in sustainable cities. Therefore, they reviewed the existing frameworks for measuring sustainable cities, which are the Green City Index, Global City Indicators Facility, and the Global Compact Cities Circles of Sustainability, to develop an indicator framework for assessing the relationship between urban agriculture and sustainability. They combined the strength of each model while creating the indicator framework. Their study focused on sustainable urban agriculture considering its economic, social and environmental dimensions. Therefore, the indicators created were categorized into three dimensions: economic, social, and environmental. The research was based on the 189 articles, reports and books related to urban agriculture and sustainable cities. The reviewing indicators for sustainable cities were used to analyze the relationship between urban agriculture and three dimensions of sustainability.

In their framework, the economic contributions of urban agriculture are mostly related to income generation and employment creation. Economic sustainability consists of five indicators which are fulltime employment, employment for women, income generation, savings and expenditure, and tax revenue. Seven indicators are related to social sustainability which are educational functions, civic engagement, safety and security, gender equality and social equity, health benefits, recreation and technology, and innovation promotion. In addition, environmental sustainability consists of the five indicators, which are management of emissions, water management, waste management, energy efficiency and organic farming.

Table 3.7 Azunra et al. Framework

Research Method	Dimensions	Indicators	Analyze Method
• Reviewing the 189 article/reports/books	Economic sustainability	• fulltime employment, • employment for women, • income generation, • savings and expenditure • tax revenue	
	Social Sustainability	• educational functions, • civic engagement, • safety and security, • gender equality and social equity, • health benefits, • recreation and technology and innovation promotion.	
	Environmental sustainability	• management of emissions, • water management, • waste management, • energy efficiency • organic farming	

3.3.3 Dielemen Framework

The aim of Hans Dielemen's Framework was focusing on urban agriculture activities that had been gaining attention worldwide. This framework especially considered the experience of Mexico City. Spatially, Mexico City was divided into three zones: peri urban, suburban, and interurban zones. The study discussed current urban agriculture experiences in these three zones and analyzed them in terms of economic, social, ecological, and symbolic dimensions.

As a first step, the study gave a general description of urban agriculture, introduced some conceptual aspects, and presented a policy framework regarding urban agriculture activities. Then, urban agriculture activities in each of the three zones were analyzed according to the contribution of urban agriculture to sustainability.

The methodology of the study was mainly based on literature research, interviews with policy representatives, site visits in each zone, and student research regarding urban agriculture issues in Mexico City. The literature review enabled the researchers to obtain quantitative data, while interviews provided information regarding experiences.

The indicators in the economic dimension were mainly about employment and income generation, the economic value generated, poverty reduction and so on. The indicators in the ecological dimension were mainly about the contribution to the ecological infrastructure of the city, waste management, reduction of pollution and so on. The indicators in the social dimension were mainly about citizen's participation, gender equity, capacity building and knowledge transfer and so on. Finally, the indicators in the symbolic dimension were mainly about the cultural meaning of urban agriculture, restoring traditional ways of living, and linking historical roots and so on. All the indicators that were used in this framework can be seen in Table 3.8.

Table 3.8 Dielemen Framework

Research Method	Dimensions	Indicators	Analyze Method
• Literature research • Interviews • Site visits • Student Research	Economic	• Employment and income generation • Availability and types of markets • New markets being created • Poverty reduced • Economic value generated	• Case Study
	Ecological	• Usage of wastes and water • Impacts on the city's ecology • Urban soil improvement by composting • Waste management • Using rainwater for irrigation • Purification of air • Lowering average temperature	
	Social	• Citizen's participation • Gender equity • Citizen involvement • Intercultural communication • Communal self-reliance • Capacity building and knowledge transfer	
	Symbolic	• The cultural meaning of urban agriculture • Restoring traditional way of living • Linking historical roots	

3.3.4 Dick Foeken - Michael Sofer - Malongo Mlozi Framework

The aim of the study conducted by Dick Foeken, Michael Sofer, and Malongo Mlozi was assessing the sustainability of urban agriculture in two Tanzanian towns: Morogoro and Mbeya. First of all, they described urban agriculture activities in these two towns. Then, they determined the importance of these activities and assessed their level of importance. Their study was conducted in these two medium-sized towns of Tanzania. Their methodology was based on qualitative and quantitative research. The research process had two different data gathering steps: general survey and in-depth survey. They selected 300 households in each town, and they conducted survey questionnaires in each household. After that, they conducted in-depth surveys with 30 selected households. In these surveys, a semi-structure questionnaire was used to obtain both qualitative and quantitative data. Besides these, two more data gathering methods were used in the study. One of them was interviews conducted with individual farmers and municipal council officials. Another was a master thesis that conducted research regarding urban agriculture issues in these towns. After the data gathering process, they observed that urban agriculture was a significant economic sector that provides employment, food, and income to many. For analyses, six dimensions of sustainable urban agriculture were selected: food supply, income generation, employment creation, the marketing of produce, environmental balance, and the legal and policy setting. Then, each of the six dimensions were analyzed according to conducted surveys and interviews.

Table 3.9 Foeken et al. Framework

Research Method	Dimensions	Indicators	Analyze Method
• Literature review • General Survey • In-depth survey • Interviews • Master Thesis	Food supply	• self-consumption in producing household • sales of produce to other urban dwellers • donations to neighbors and relatives in town	• Case study
	Income Generation	• direct income through sales of crops, animals and animal products • indirect income through saving on food costs	
	Employment Creation	• Family labor • for laborer's in urban gardens and on farms • for suppliers of inputs • for transporters of produce • for extension officers	
	Marketing of Produce	• ready access to markets • smooth marketing channels for agricultural products produced in town	
	Environmental balance	• awareness of the impact of ua on the urban environment and willingness to take the environment into account • practice organic farming • abstain from use of polluted water for irrigation • proper management of livestock waste • practice recycling	
	Enabling Legal and Policy Setting	• producers to abide by laws and regulations • guaranteed access to open spaces for farming purposes for a certain period of time	

3.3.5 Clerino and Fargue-Lelièvre Framework

Clerino and Fargue-Lelièvre have developed a framework that contains objectives and criteria for assessing urban agriculture sustainability. They identified six sustainability objectives and twenty-one criteria applicable to intra urban farms in France. They used a participatory approach in every step of the study. They conducted focus groups, online surveys, and interviews with several stakeholders of the French urban agriculture region. These stakeholders included professional urban farmers, local authorities and landowners as decision makers, farmer federations, consulting firms, researchers, and lecturers as advisory to urban farmers.

At the end of all these participatory research steps, they obtained a set of six sustainability objectives:

- Environmental impact
- Link to the study
- Economic and ethical meaning
- Food and environmental education
- Consumer and producer connection
- Socio-territorial services.

To reach these sustainability objectives of urban agriculture, they specified twenty-one criteria in terms of economic, socio-territorial, and agro-environmental dimensions.

They suggested that based on their framework, indicators could be redesigned to measure the sustainability of urban agriculture activities.

Table 3.10 Clerino and Fargue-Lelièvre Framework

Research Method	Dimensions	Indicators	Analyze Method
• Focus group of experts. • Two Online surveys • Interviews	Economic	• Number of jobs, types of contracts, local jobs • Added value of the goods and services produced. • Sources of revenue • Redistribution to collaborators and stakeholders • Project continuity • Project leader's status	• Participatory Approach
	Socio-Territorial	• Partners on territory Local network of suppliers, involvement in networks, exchange of equipment, link with rural agriculture • Link with inhabitants • Knowledge sharing and education. • Working conditions and inclusion • Risk management, health and security • Governance transparency and management • Improvement of local living conditions	
	Agro-Environmental	• Cropped biodiversity • Non-cultivated biodiversity • Resources-efficient process • Resources consumption • Resource recycling • Local pollution identification and technical adaptation	

So far, Chapter X answered the Sub-Question 2: **"What is the most suitable approach to the assessment of the sustainability of the urban agriculture activities in terms of economic, social, and environmental dimensions?"** The six assessment frameworks that deal with assessment of different dimensions of sustainability have been examined. Each assessment framework uses different indicator sets according to the sustainability dimensions being considered. There are many different indicators, but there is no certain decision on which framework should be used to assess urban agriculture activities. Thus, selection of the most appropriate set of indicators relating to contribution themes is a significant issue at that point. This thesis focuses on three dimensions of sustainability: economic, social and environmental. In light of the explained frameworks, the most relevant indicators are selected in the context of this thesis in accordance with the contribution themes.

Table 3.11 Summary of Sustainability Assessment Frameworks of Urban Agriculture

SUB-QUESTION 2

What is the most suitable approach to the assessment of the sustainability of the urban agriculture activities in terms of economic, social, and environmental dimensions?

Frameworks	Indicators		
	Economic	**Social**	**Environmental**
Vasquez-Moreno & Cordova	• harvest composition, volume, losses • seasonality of production • surplus volumes and destinations • costs (including employees), income obtained (primary/secondary), investments • scale of production, factors promoting or hindering scale increases	• the number of people benefitted • whether it provided food security and/or food quality • the nature and interactions with others through urban agriculture	• crop diversity • crop rotation and soil management • waste management • water sources • organic production • types/use of agrochemicals • knowledge of alternative /traditional agricultural practices/inputs.

Table 3.10 (cont'd)

Frameworks	Indicators		
	Economic	**Social**	**Environmental**
Azunre et al.	• fulltime employment, • employment for women, • income generation, • savings and expenditure • tax revenue	• educational functions, • civic engagement, • safety and security, • gender equality and social equity, • health benefits, • recreation and technology and innovation promotion.	• management of emissions, • water management, • waste management, • energy efficiency • organic farming
Dielemen	• employment and income generation • availability and types of markets • new markets being created • poverty reduced • economic value generated	• citizen's participation • gender equity • citizen involvement • intercultural communication • communal self-reliance • capacity building and knowledge transfer	• usage of wastes and water • impacts on the city's ecology • urban soil improvement by composting • waste management • using rainwater for irrigation • purification of air • lowering average temperature
Foeken et al.	• direct income through sales of crops, animals and animal products • indirect income through saving on food costs • Family labor • for labors in urban gardens and on farms • for suppliers of inputs • for transporters of produce • for traders of produce • for extension officers	• self-consumption in producing household • sales of produce to other urban dwellers • donations to neighbors and relatives in town	• awareness of the impact of urban agriculture on the urban environment and willingness to take the environment into account • practice organic farming • abstain from use of polluted water for irrigation • prevention of erosion • proper management of livestock waste • practice recycling

Table 3.10 (cont'd)

Frameworks	Indicators		
	Economic	**Social**	**Environmental**
Clerino & Fargue-Lelièvre	• Number of jobs, types of contracts, local jobs • Added value of the goods and services produced • Sales channels, labels, and traceability • Sources of revenue • Redistribution to collaborators and stakeholders: • Weights of grants and subsidies: • Project continuity: • Project leader's status:	• Partners on territory Local network of suppliers, involvement in networks, exchange of equipment, link with rural agriculture • Link with inhabitants • Knowledge sharing and education • Working conditions and inclusion • Risk management, health and security • Governance transparency and management • Improvement of local living conditions	• Cropped biodiversity • Non-cultivated biodiversity • Resources-efficient process • Resources consumption • Resource recycling • Local pollution identification and technical adaptation

CHAPTER 4

THE CASE STUDY: ASSESSING THE SUSTAINABILITY OF URBAN AGRICULTURE ACTIVITIES OF ÇANKAYA MUNICIPALITY

Urban agriculture activities undoubtedly contribute to many dimensions of sustainability. Many countries use urban agriculture as a tool for reaching sustainable development. Due to the economic, social, and environmental contributions stated in previous chapters, urban agriculture plays a crucial role in achieving sustainability of urban areas. Therefore, defining the relationship between urban agriculture activities and sustainability in urban areas is the main aim of this thesis. For that reason, two case study areas were selected, and their sustainability were assessed, while defining this relationship. A questionnaire study within the scope of the formed indicators was conducted in the case study areas to assess the economic, social, and environmental sustainability. This chapter includes five main parts. Firstly, the set of indicators that were formed in light of contribution themes and indicators of current assessment frameworks in literature was presented. Then, the background information regarding urban agriculture in Turkey and in Ankara is given, to clarify the general context. The third part defined urban agriculture activities of Çankaya Municipality in light of the COST approach explained in Section 2.2.2. In that part, besides the general information about the project, the information obtained from semi-structured interviews was also mentioned. The fourth part explained the case study by giving the questionnaire methodology used and analyses the sustainability assessment results of the case study. Finally, the last part discussed all main findings.

4.1 Forming Assessment Indicators of Urban Agriculture Sustainability

The previous sections reviewed the contribution themes and assessment indicators of urban agriculture. In light of these sections, a set of contribution themes and indicators have been created in terms of the economic, social, and environmental dimensions of sustainability. Using these contributions themes and indicators, the indicator set of the thesis was formed.

The five assessment frameworks which assess the contributions of urban agriculture to sustainability were analyzed. Most of the analyzed studies deal with the economic, social, and environmental dimensions of sustainability. The thesis' assessment framework consists of the same three main dimensions: economic, social, and environmental. As part of these three main dimensions, nine themes were formed. These themes were formed based on the contribution themes in Chapter 3.2.

- The economic dimension includes the themes of income generation, savings, and innovation, research, and entrepreneurship.
- The social dimension includes the themes of food security, community development & interaction, and educational functions.
- The environmental dimension includes the themes of waste management, clean production and greening the cities.

According to the dimensions and themes, eighteen assessment indicators were created. The table below shows the main dimensions, themes and indicators used in the sustainability assessment of urban agriculture activities of Çankaya Municipality.

The indicators in the resulting assessment framework were tested via interviews with the municipality officials and questionnaires with people who participated in urban agriculture activities in Çankaya. The next section discusses the urban agriculture activities in Çankaya and assesses the sustainability of these activities.

Table 4.1 Indicator set of thesis

Dimensions	Themes	Indicators
Economic	Income generation	Provide a source of income Sell the surplus production
	Savings	Provide partial savings through self-sufficiency
	Innovation, research, and entrepreneurship	Form new businesses after joining urban agriculture activities Use learnt information in innovative research areas
Social	Food security	Provide access to healthy and fresh foods Enable organic production and farming
	Community development & interaction	Increase social interaction and cohesion between different groups Provide learning and training experiences for citizens
	Educational functions	Enhance awareness among citizens about food production by educational activities, like workshops, and courses Develop skill and practical knowledge regarding agriculture Connect to traditional practices and local knowledge with citizens
Environmental	Waste management	Use wastewater/rainwater for irrigation Encourage recycling and reuse Use households and agricultural organic residues as a compost
	Clean production	Non-use of agrochemicals
	Greening the cities	Promote the green areas in a built environment Support connection between green areas and citizens

4.2 Background of Urban Agriculture in Turkey and in Ankara

Unlike world examples, urban agriculture activities in Turkey have not been developed systematically. There are only a few Turkish examples that can be specified as urban agriculture activities, which are: Gürpınar Urban Agriculture Projects of Yeryüzü Association in İstanbul in 2005, City Garden Project of Buğday Ecological Life Association in Mersin, Çukurova, Ankara, İstanbul in 2015, and City Garden Project of Yeryüzü Association in 2017-2021. These projects aim to benefit from urban agricultural activities by reducing poverty and unemployment, preventing loss of traditional seeds, and creating green spaces in the built environment (Kayasü, Büyükcivelek, Durmaz, Karadoğan, Akça, 2020).

In the case of Ankara, Atatürk Forest Farm could be an example of urban agriculture. The first urban agriculture activities in Ankara may have been started with the establishment of the Atatürk Forest Farm. The major aim of building this city farm was related to the main benefits of urban agriculture (Arapgirlioğlu and Baykan, 2012, p.175):

- Providing the Anatolian cities with safe and healthy daily products
- Creating an employment and production center
- Empowering urban life with new public and leisure uses

In other words, it supports the main aims of urban agriculture in cities, such as food security, employment creation and social empowerment. With these aims, Atatürk Forest Farm could be described as an important example of “urban agriculture” in Ankara. However, over the years, the activities of Atatürk Forest Farm have decreased, and it has lost its significance. Therefore, awareness of the importance of agriculture inside the city has been decreasing day by day in Ankara. At the end, agriculture has become an activity conducted outside the city.

Besides that, people also grow food on vacant land, in front yards or backyards and on balconies of houses inside the city. These activities are not systematic but could also be defined as examples of urban agriculture in Ankara.

Figure 4.1. Example of urban agriculture activities in balcony and backyards in Ankara. (Source: Municipality Officers, Aycan's Personal Archive)

Moreover, since 2014, non-governmental organizations have established city gardens in Çiğdem, 100.Yıl Neighborhood and the METU campus (Kayasü et al., 2020). One of these is Çiğdemim Neighborhood Garden established by Çiğdemim Association. This garden aims to support cooperation among citizens in the neighborhood and to increase awareness regarding organic food production, food security and the significance of urban agriculture.

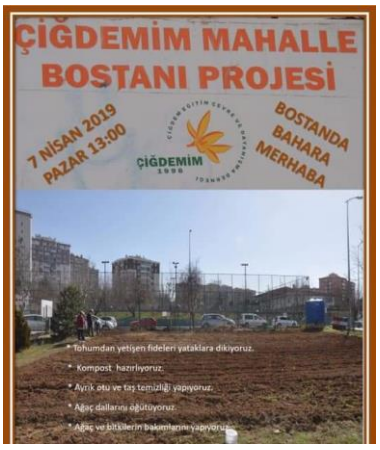


Figure 4.2. Çiğdemim Neighborhood Garden. (Source: Çiğdemim Association)

Another one is METU Garden, established in cooperation with the METU Rectorate and the Buğday Ecological Life Association in 2015. This project aims to bring students and employees to the campus, show that agriculture is possible in the city, improve collective production activities, and support organic production (Dalgıç, 2016, pp.52-53).

Figure 4.3. The production in METU Garden. (Source: METU Garden Social Media Account)

In recent years, urban agriculture has started to be part of the agenda of public institutions in Ankara. Ankara Development Agency have been developing a strategy document within the scope of improving urban agriculture projects. Moreover, Çankaya Municipality established two Urban Agriculture Houses in Çankaya, where many theoretical and practical activities are being conducted for urban agriculture training. This thesis will analyze the urban agriculture activities there and assess sustainability of these activities in terms of the indicator set of thesis.

4.3 Defining Urban Agriculture Activities of Çankaya Municipality

It can be stated that urban agriculture is a new term for Turkey compared to other countries. Therefore, urban agriculture activities are not very common in the context of Ankara and Turkey's other cities. However, in recent years the importance of food security and self-sufficiency have been realized with the effect of Covid-19. Thus, people want to learn growing their own food in urban areas. Çankaya Municipality has established two Urban Agriculture Houses by aiming to teach people to grow their own food in 2015 and 2018. Before urban agriculture houses were established, the urban agriculture team of the municipality had worked toward developing

agriculture only in rural areas in Ankara. During these studies, they received many questions from urban citizens about doing agriculture in the city. Therefore, they expanded their study area and started to work for urban agriculture. At the end, they examined examples from various countries (Cuba, England), and in 2015 Mutlukent Urban Agriculture House, and in 2018 Ata Urban Agriculture House were opened, providing both theoretical and practical training.

Therefore, the areas of Ata and Mutlukent Urban Agriculture House were selected as a case study to assess sustainability of urban agriculture activities. The projects of Çankaya Municipality were selected because it is the only public institution that was conducting urban agriculture applications in Ankara. Moreover, these areas are good examples of urban agriculture because they are located in dense urban areas. Ata Urban Agriculture House is located in Dikmen district, while Mutlukent Urban Agriculture House is located in Ümitköy-Çayyolu district.

In this section, the urban agriculture activities of Çankaya Municipality will be defined in light of the components of the COST definition mentioned in Chapter 2.2.2. Each component of urban agriculture houses will be explained. Moreover, the information regarding urban agriculture houses which was obtained from semi-structured interviews will be provided, such as locations, aims, and the models of the projects.

The first component is ***the spatial*** component which refers to the location of urban agriculture. The COST (2013) stated that the degree of proximity to the urban area plays a significant role in defining the type of urban agriculture. The first study area, named Mutlukent Urban Agriculture House, located in the Çayyolu district in Çankaya, is near the M. Ali Güler Park and surrounded by dense residential areas. This place was established in 2015 by Çankaya Municipality. It is approximately 2,000 m² and consists of 48 agriculture parcels.

Figure 4.4. Location of Mutlukent Urban Agriculture House.

Source: Personal drawing

Figure 4.5. Images of Mutlukent Urban Agriculture House showing the surrounding residential areas.

Source: Çankaya Municipality

Another agriculture house, named Ata Urban Agriculture House, located in the Öveçler district in Çankaya, is also near the linear parks, Destine Peri Parlak Park, Ünal Temizyürek Park and Ata Green Corridor Park. It was established in 2018 by the Çankaya Municipality. It is smaller scale than Mutlukent, approximately 1.500 m² and consists of 8 agriculture parcels.

Figure 4.6. Location of Ata Urban Agriculture House. (Source: Personal drawing)

Figure 4.7. Images of Ata Urban Agriculture House showing the surrounding residential areas. (Source: Çankaya Municipality)

The agriculture activities of both areas could be defined as urban agriculture activities because both of them are located in the densely settled areas surrounded by housing.

The second component is ***the functional component.*** The functional component consists of several sets of functions. These functions could serve for the purposes of either gardening or farming. The core activity of these areas is providing training, education, social activities and recreational opportunities. The municipality officials

stated that production is a secondary aim because the primary aim is to provide social and environmental benefits, such as bringing together the city and agriculture, more than providing economic benefits.

> "This model of Çankaya Municipality does not provide much economic benefits because it is aimed at providing social and environmental benefits, such as bringing together the city and agriculture.
>
> Our main purpose is to teach basic principles of ecologically sensitive agriculture, basic gardening knowledge, and examples of vertical gardening. We think that people in the city also need to learn to produce their own food. We want to bring agriculture to the city. We want to raise people's awareness of agriculture." (Interviewee 1)

This shows that as WinklerPrins (2017) and Taguchi & Santini (2019) stated that, these areas are seen as a way of reconnecting people and their food resources to create a social link between a community and agriculture. Therefore, their function could be defined as gardening.

Moreover, the function of urban agriculture case study areas conforms with the function of the community gardens. According to Knapp et al. (2016, p. 2), community gardens is an urban agriculture area producing edible products by shared responsibility, with non-entrepreneurial aims. These areas are established by private individual initiatives, social organizations, or public institutions. A public institution, Çankaya Municipality, established these case study areas by aiming to teach agriculture to citizens in urban areas. Participants have shared responsibility for gardening work in these areas. Therefore, the function component of these case study areas is also related to the functions of community gardens. We can define the case study areas as community gardens that provide gardening activities for citizens.

The third component is ***the market component.*** The literature states that in many cases, urban agriculture mostly produces goods for the local market or household usage. There are few direct market linkages in urban agriculture. Here, the

municipality officials stated that the produced goods are used only for household usage.

> "Each participant uses his own product. There is not enough product to sell." (Interviewee 2)

> "Not much product is obtained. The collected products are shared by the garden participants. They have ideas such as donating residual products to nurseries and child protection institutions for in the future." (Interviewee 1)

The fourth component is ***the origin component*** that refers to the reasons behind the establishment of urban agriculture areas. They may have been unplanned or purposely designed.

> "Previously, the municipality team only worked on agricultural development in rural areas. During these studies, we received many questions from urban citizens about agriculture in the city. Therefore, we expanded our study area and started to work on urban agriculture. At the end, we examined examples from various countries, such as Cuba and England. In light of these examples, Mutlukent Urban Agriculture House opened in 2015, with the aim of providing both theoretical and practical training." (Interviewee 1)

Essentially, the citizens requested these areas so they could learn agriculture. For that reason, the Çankaya Municipality purposely planned to establish such urban agriculture houses in 2015.

The fifth component, the ***actor component*** of urban agriculture, relates to the human being who performs the agricultural activities (either alone or in a group). As mentioned previously, COST (2013) categorizes the actors into three groups: conventional farmers, hobby farmers, and private non-farmers. The actors in the case study areas mainly belong to last group of actors: private non-farmers. They generally perform agricultural activities in areas belonging to private or public authorities, such as the community/municipality or a housing company/ cooperative. They do not have an agricultural background, so they are defined as private non-

farmers. Similarly, the case study areas belong to the municipality and the participants do not have any agricultural background. Therefore, the actor component can be defined as private non-farmers. Besides that, all the theoretical and practical urban agriculture training in these areas is organized by the Urban Agriculture Team in Çankaya Municipality. This makes them another one of the actors.

The sixth component is ***the motivation component***, which is related to the desire behind the establishment and maintenance of urban agriculture activities. Essentially, the motivation behind urban agriculture depends on the purpose of urban agriculture. A municipality official states their purpose as:

> "We established this area to enable people to grow food on their own, to ensure that they have access to healthy food with their own means, to create an additional place for recreational activity for certain age groups, and to be a pioneer for raising awareness among young people regarding agricultural production." (Interviewee 2)

Therefore, the motivations behind these activities are related to social and environmental concerns.

The last component is ***the stakeholder component,*** which deals with a number of individuals, groups, and institutions that take advantage of urban agricultural activities. The beneficiaries of case study areas are participants who attend the urban agriculture activities and courses. As COST (2013) mentioned, the participants obtain direct advantages such as education, recreation, social integration, and so on.

To conclude, all components of the urban agriculture houses are defined in accordance with the COST definition provided in Section 2.2.2. Spatially, they are located inside the city in dense urban areas, and functionally, they could be defined as a gardening activity that provides education and recreation. Their market orientation is limited, mostly intended for household usage. They are purposely planned, and their motivation is social and environmental concerns. Their actors are

private non-farmers, lecturers, and municipality officials. Their stakeholders are participants who attend the courses conducted in these areas.

Table 4.2 The components of Urban Agriculture Houses of Çankaya Municipality.

Components	
Spatial	In dense urban areas
Functional	Community garden: education, social and recreational
Market-orientation	Household usage
Origin	Purposely planned
Actor	Private non-farmers and lecturers
Motivation	Social and environmental concerns
Stakeholder	Participants

4.4 Assessing the Sustainability of Current Urban Agriculture Activities of Çankaya Municipality

This thesis questions the relationship between urban agriculture and sustainability. Seeking the answer to this question, the contributions of urban agriculture to economic, social and environmental dimensions of sustainability were analyzed. In addition, the current sustainability assessment frameworks of urban agriculture activities were analyzed in terms of those same dimensions. At the end, by combining the key findings of the literature, the author formed a set of themes and related indicators that assess the sustainability of urban agriculture in Section 4.1. The questionnaire and interview questions were designed in accordance with the formed indicators, and the urban agriculture activities of the case study areas were assessed in terms of the economic, social, and environmental dimensions of sustainability. The first part of this chapter will provide general information regarding the sustainability assessment questionnaire study, such as the structure of the questionnaire, the data collection process, and so on. Then, the obtained data will

be analyzed in the assessment section, in terms of the economic, social and environmental dimensions.

4.4.1 The Sustainability Assessment Questionnaire Study

During the research, firstly, the Çankaya Municipality and Mutlukent Urban Agriculture Areas were visited, and the working officials there were asked a set of open-ended questions. These semi-structured interviews were carried out with a municipality official working in the Urban and Agriculture Study Group in Çankaya Municipality, in order to obtain general information about the projects. The questions in the interviews were divided into four parts:

1. Questions related to general information about urban agriculture studies and applications in Çankaya.
2. Questions related to economic sustainability.
3. Questions related to social sustainability.
4. Questions related to environmental sustainability.

After conducting the pilot case study, the data obtained by literature review was combined with data from those semi-structured interviews, and the questions were created for the questionnaire. The questionnaire studies were conducted with participants of the urban agriculture houses in the case study areas. In the questionnaire study, the indicator set of thesis tested the contributions of the urban agriculture activities to urban sustainability in Çankaya.

Firstly, the author visited the Mutlukent Urban Agriculture House and applied the questionnaire face-to-face. During the questionnaire study, the Urban Agriculture Houses were closed due to the Covid-19 pandemic, so it was difficult to find sufficient number of face-to-face participants. Therefore, most of the questionnaire study was conducted online. Google Forms was used to gather data. The municipality officials helped to reach participants. They shared the questionnaire form in their official social media account and participants answered the questions. This online survey provided some advantages for the thesis. For instance, the online survey

helped to reach people who participated in the case study areas in different years. Moreover, it was observed that participants are more willing to answer open-ended questions in an online survey compared to a face-to-face survey.

The questions in the questionnaire tested each of the indicator sets in relation to the economic, social, and environmental dimensions of sustainability. The questionnaire consisted of 4 parts.

Part 1 included questions related to general information about the individual and the urban agriculture house. Part 2 consisted of questions related to economic sustainability. Part 3 consisted of questions related to social sustainability. Part 4 consisted of questions related to environmental sustainability. There was a total of 22 questions in these 4 parts. The question types included yes/no questions, Likert scale, and open-ended questions.

The first part of the questionnaire aimed to gather general information regarding the participant. This part included questions about which urban agriculture house they attended, the year of attending, the parcel owner status, gender, age, and working status.

The second part of the questionnaire was related to the economic dimension of sustainability. Questions were identified in light of the themes found in literature review. These themes were **income generation; savings; and innovation, research, and entrepreneurship**. The theme of innovation, research, and entrepreneurship was not included in the questionnaire because in the pilot study it was observed that this theme was not seen in these case study areas.

The third part of the questionnaire was related to the social dimension of sustainability. Questions related to the themes of **food security; community development & interaction; and educational functions** were identified in light of the literature review.

The fourth part of the questionnaire was related to the environmental dimension of sustainability. Questions related to the themes of **waste management; clean production; and greening cities** were identified in light of the literature review.

These themes were asked with Yes/No and Likert scale questions. At the end of every part, an Open-ended question was asked to gather the general opinion of participants regarding the economic, social, and environmental dimensions. Table 4.3 shows the question numbers of the related themes.

Table 4.3 Question's numbers of the related themes in Questionnaire

Dimensions	**Themes**	**Questions**
Economic	Income generation	Q9 – Q11 – Q 12
	Savings	Q10 – Q13
	Innovation, research, and entrepreneurship	-
Social	Food security	Q16-1– Q15
	Community development & interaction	Q16-2 – Q16-3
	Educational functions	Q16-4 – Q16-5 – 16-6
Environmental	Waste management	Q18 – Q21-1 – Q19
	Clean production	Q20
	Greening the cities	Q21-2 – Q21-3

The Yes/No and Likert scale questions were evaluated through ratio in terms of Mutlukent and Ata Urban Agriculture Houses. Content analysis was made in order to evaluate Open-ended questions. Some key words related to the set of indicators were search in participant's answers. Then, these keywords were coded to find out the frequency of mentions and their ratios were compared.

4.4.2 Result of the Questionnaire

Before pandemic, the number of participants in Mutlukent was approximately total 180 (30 parcel owner and 150 non-parcel owner), and the number of participant in Ata were total 50 (15 parcel owner and 35 non-parcel owner). However, the Çankaya Municipality could not enroll the participants in 2020 because of pandemic situation. Therefore, the questionnaire study was conducted with 38 people who participated in urban agriculture practices of Çankaya Municipality. Of those, 32 of them belonged to Mutlukent Urban Agriculture House, while 6 of them belonged to Ata Urban Agriculture House. Despite all efforts, sufficient participants could not be reached in the Ata Urban Agriculture House because of pandemic situation. In fact, the number of participants of Ata were less than Mutlukent before pandemic. Moreover, the participants of Ata Urban Agriculture House were not willing to join online questionnaire. Because the number of participants was not equal, each urban agriculture house was evaluated in its own context.

The parcel owner status is one of the important parameters for urban agriculture houses of Çankaya Municipality. Participants could attend some of these activities as a parcel owner or not. Non-parcel owners could attend only the theoretical lessons, but not the practical activities. If a participant owned a parcel in these areas, they could practice agriculture there. The result of the parcel owner status was shown separately for each urban agriculture house. In Mutlukent Urban Agriculture House, 59% of participants owned a parcel, while 41% of participants did not. In Ata Urban Agriculture House, 17% of participants owned a parcel, while 83% of participants did not. This differences between parcel owner status in two urban agriculture houses affected contributions of urban agriculture to sustainability. In Ata, where parcel owner status was low, it is not observed total agreement in contributions of urban agriculture to sustainability. This situation will be discussed in the following survey questions.

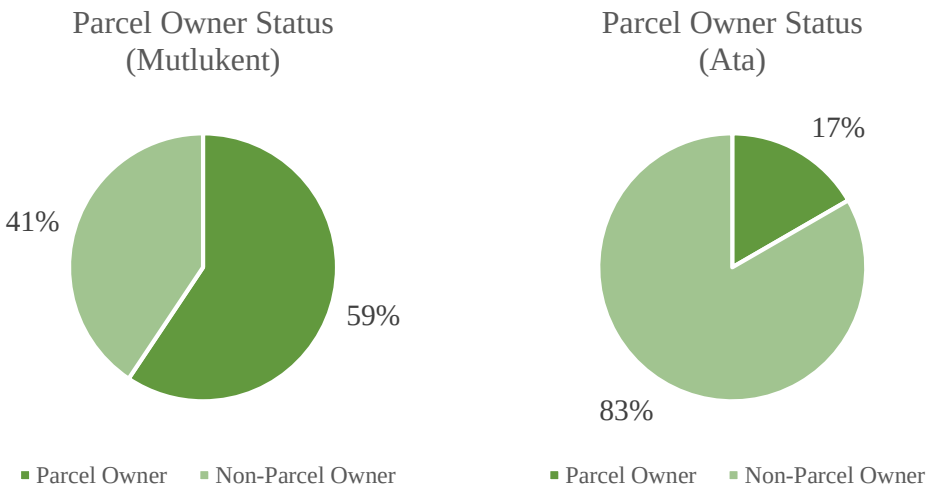


Figure 4.8. Parcel owner status of urban agriculture houses

In general, 53% of participants were women (20 women) and 47% of participants were men (18 men). In Mutlukent Urban Agriculture House, 50% of participants were women (16 women) and 50% of participant were men (16 men). In Ata Urban Agriculture House, 67% of participants were women (4 women) and 33% of participant were men (2 men). In general, no gender was dominant in urban agriculture practices, so women and men showed equal participation in these activities. The gender distributions are seen in the Figure 4.9 below.

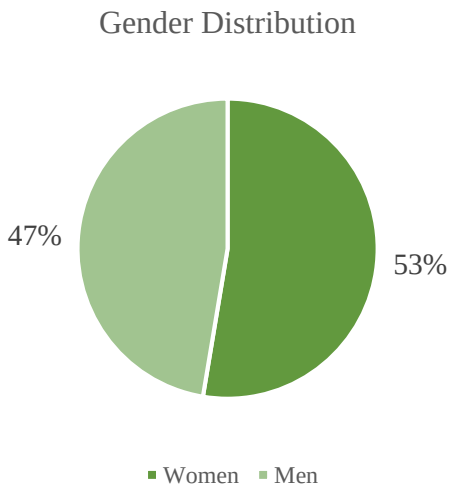


Figure 4.9. Gender distributions of urban agriculture houses

Overall, 84% of the participants were between the ages of 46-65 (32 participant). There were no participants under the age of 25. There were 3 people, or 8% of participants, who were between the ages of 26-45. There were 3 people, or 8% of participants who were 65+. The result of the age distribution shows that urban agriculture activities in the case study areas are mostly done by people who are above the age of 45. The age distribution is seen in the Figure 4.10 below.

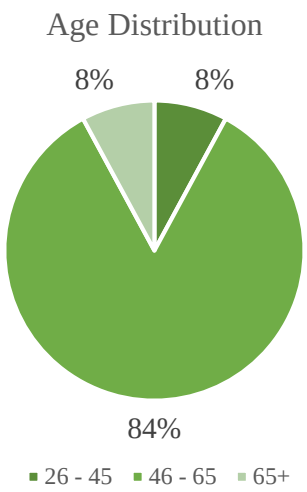


Figure 4.10. Age distributions of urban agriculture houses

The questionnaire also gathered data about the working status of participants. Of the survey participants, 68% were retired people (26 participant), 19% were working people (7 participants), and 13% were not working (5 participants). This result shows that mostly retired or nonworking people were engaged in urban agriculture activities of Çankaya Municipality.

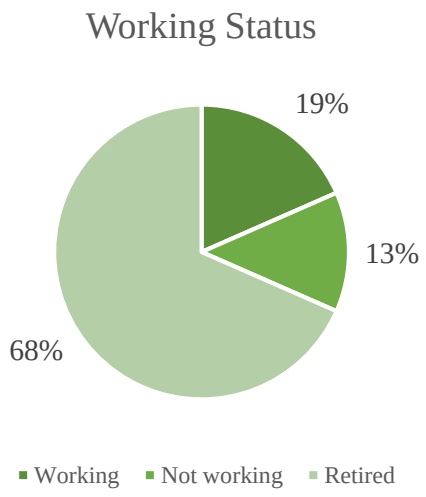


Figure 4.11. Working status of urban agriculture

In next chapter, the result will be assessed in terms of economic, social, and environmental dimensions of sustainability.

4.4.3 Economic Assessment

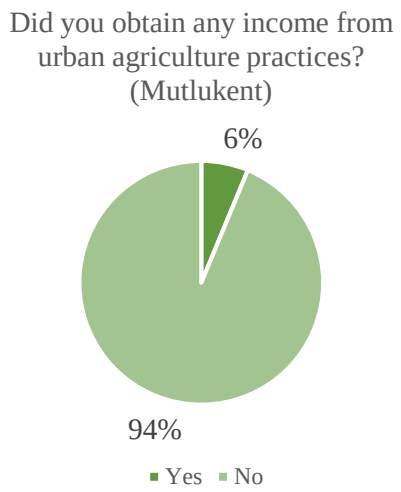
The second part of questionnaire was related to the economic dimension of sustainability. The previously mentioned indicator sets were presented to participants to assess the economic dimension of sustainability. These indicators were related to the themes of income generation and savings, as seen in Table 4.4.

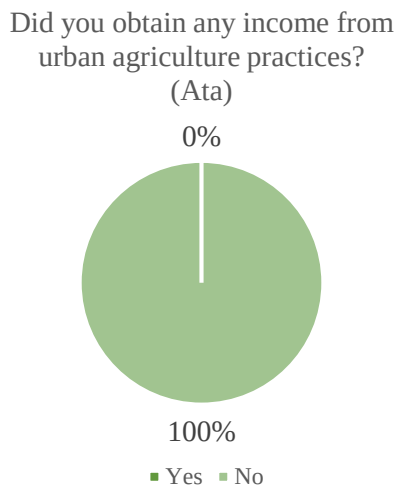
Table 4.4 Indicators of Themes of Economic Dimension

Dimensions	Themes	Indicators
Economic	Income generation	Provide a source of income Sell the surplus production
	Savings	Provide partial savings through self-sufficiency

The first theme of the economic dimension, ***income generation***, aimed to analyze whether urban agriculture activities generated income or not. For that purpose,

participants were asked whether these urban agriculture activities provided income for a part of their budget as a first indicator. In Mutlukent Urban Agriculture House, 94% of participants stated that they did not obtain any income from urban agriculture activities there. Only 6% of participants said that they obtained some income. In Ata Urban Agriculture House, all participants said that they do not obtain any income from these urban agriculture practices.



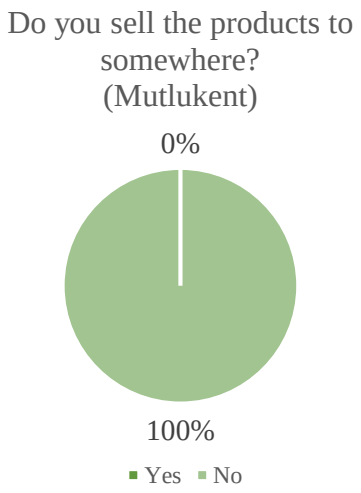


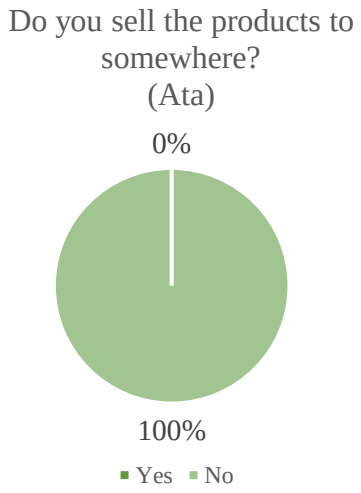
	Number of people	Ratio (%)
Yes	2	6%
No	30	94%
Total	32	100%

	Number of people	Ratio (%)
Yes	0	0%
No	6	100%
Total	6	100%

Figure 4.12. Result of indicator “providing a source of income”.

Another indicator of the theme of income generation in terms of economic sustainability of urban agriculture activities is obtaining economic benefit from selling surplus production. In many cases of urban agriculture activities, people gained income in this way. However, all participants stated that the products they produced were not sold in Mutlukent and Ata Urban Agriculture Houses. Therefore, participants do not obtain economic benefit by selling their products.





	Number of people	Ratio (%)
Yes	0	0%
No	32	100%
Total	32	100%

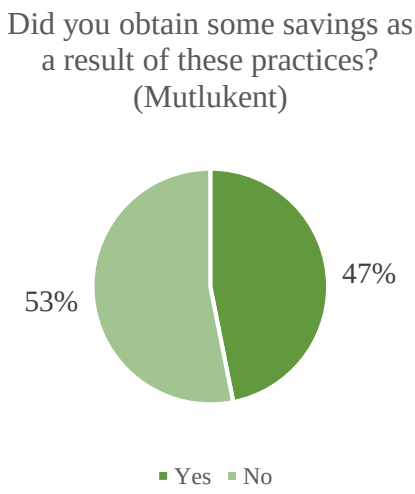
	Number of people	Ratio (%)
Yes	0	0%
No	6	100%
Total	6	100%

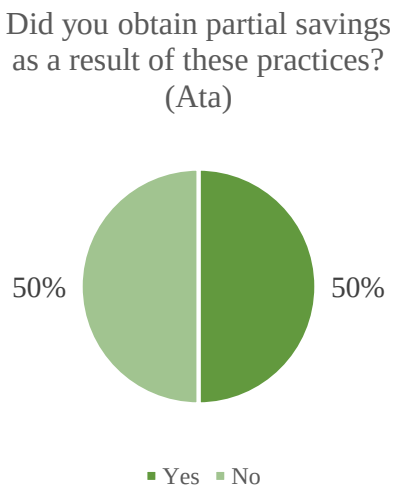
Figure 4.13. Results of indicator “selling the products”.

This result shows that urban agriculture activities in case study areas do not provide a source of income. Participants did not attend here aiming income generation. Also, Çankaya Municipality did not aim to provide income to the participants as a result of urban agriculture activities in that scale.

The second theme is providing savings through urban agriculture activities. Agricultural activities in urban areas ensure the self-sufficiency of citizens. As a result of self-sufficiency, people are able to obtain partial savings from their food expenses. Therefore, to assess economic sustainability of urban agriculture activities in Mutlukent and Ata neighborhoods, participants were asked whether they obtained partial savings as a result of those activities. In Mutlukent Urban Agriculture House, 47% of participants stated that they obtained some savings, while 53% of them did not. In Ata Urban Agriculture House, 50% of participants stated that they obtained partial savings, while the others did not. As a result, there is no absolute agreement

that urban agriculture activities provide savings for participants in these cases but it can be claim that urban agriculture activities provide partial savings for participants.





	Number of people	Ratio (%)
Yes	15	47%
No	17	53%
Total	32	100%

	Number of people	Ratio (%)
Yes	3	50%
No	3	50%
Total	6	100%

Figure 4.14. Results of indicator “obtaining savings”.

Moreover, participants were asked how they used products they produced. Most of participants stated that they consume products in home for family use. Also, some of them stated that they used information obtained from courses in urban agriculture houses in their own gardens:

> *“I applied the theoretical and practical information I received from the course for one year in my garden. We consumed the products that we produced at home. Also, I have never used chemical pesticides in the garden, so I did not buy chemical pesticides by paying money. I made organic pesticides by using information I learned in the urban agriculture house. I did the pruning myself, and I have not given money to anyone else for pruning. I think that these can also be considered as an indirect economic contribution.” (Participant 15, Mutlukent)*

For instance, a participant calculated the obtained savings from urban agriculture activities in a month in 2018. He prepared a table that shows the piece and kilograms of harvests obtained from 8,45 m² area. Then, he calculated their equivalent market price by using price of organic market in same neighborhoods. At the end, he found out that they received total savings of 543 Turkish Liras. Therefore, his food expenses were diminished 543 TL in a month.

Table 4.5 Total savings of a participant of Mutlukent Urban Agriculture House in 2018.

Source: Adapted from participant's table

	Harvest (piece)	Harvest (kg)	Price of Organic Market	Economic Equivalent in the Organic Market
Courgette	31	16,2	8	129,6
Cucumber	17	3,2	8	25,6
Pepper	218	2,7	10	27
Aubergine	3	0,6	8	4,8
Corn	1	0,1	3	0,3
Tomatoes	382	43,6	8	348,8
Melon	3	1,4	5	7
			Total Savings	*543,1*

Actually, this shows that urban agriculture activities in these areas provided partial savings for participants indirectly by reduction in food expenses.

Results of open-ended questions also show that participants mentioned only the terms related to obtaining savings in the economic dimension. When looking at the results of content analysis in Table 4.6. The mentioned key words related to obtaining savings in economic dimension constituted 10% of total results. They mentioned two issues frequently in terms of obtaining saving in the economic dimension:

- Reduction in food expenses as produced foods were used.
- Production of more foods as a result of conscious production.

A participant stated reduction in food expenses as produced foods are used as:

> *"Since I did not buy the vegetables that I grow here from market, there was a decrease in my expenses." (Participant 26, Mutlukent)*

Another participant stated production of more foods as a result of conscious production as:

> *"I learned how to grow my own food here. This opportunity provided economic benefits in terms of my food expenses. I have been growing my own vegetables for many years thanks to the information I got here. Also, I learned how to produce more foods." (Participant 30, Mutlukent)*

Table 4.6 Results of open-ended questions

Dimensions	Indicators	Frequency of Mention			Ratio
		Mutlukent	Ata	Total	
Economic	obtaining savings	12	-	12	10%
Social	gaining knowledge	28	8	36	30%
	socialization	18	2	20	16%
	community interaction	6	3	9	7%
	sharing	4	4	8	7%
	experience	6	-	6	5%
	food security	4	-	4	3%
	food self-sufficiency	1	-	1	1%
Environmental	increasing environmental awareness	11	-	11	9%
	increase agricultural awareness	-	6	6	5%
	recycling	3	-	3	2%
	clean production	2	-	2	2%
	providing green areas	2	-	2	2%
	waste management	1	1	2	2%
	Total	**98**	**24**	**122**	**100%**

To conclude, the impacts of Mutlukent and Ata Urban Agriculture Houses on economic sustainability were found to be limited. As Hallett et al. (2016) mentioned, social aims such as community development and education are more visible than economic aims for many urban agriculture areas.

Moreover, these results prove that the case study areas were developed as a community garden. Many proponents of urban agriculture state that people receive financial benefits from these activities by growing and consuming food (Nogeire-McRae et al., 2018, p.751). In other words, the main goals of these areas were not for the market. People do not sell the products, that is why they defined them as community gardens. Therefore, the thesis found that urban agriculture makes a limited contribution to job creation or to primary or secondary source of income in terms of economic sustainability.

4.4.4 Social Assessment

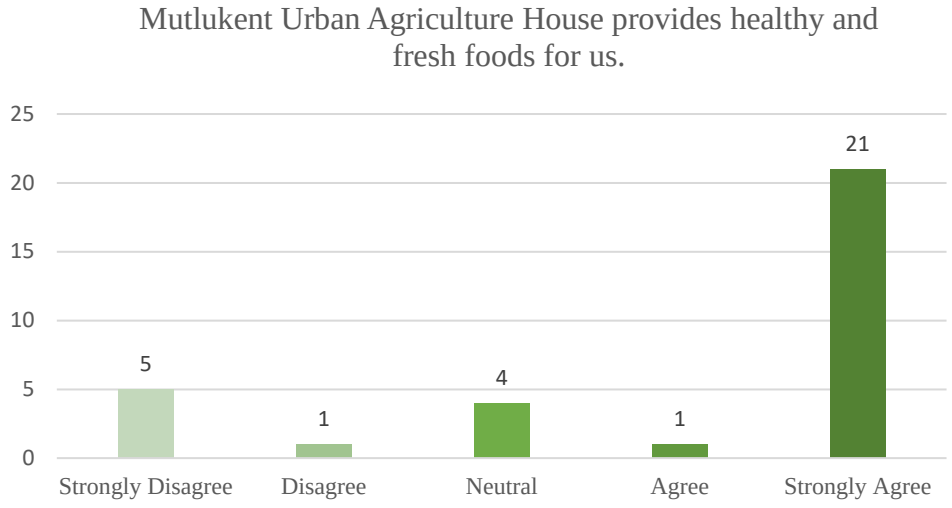
The third part of the questionnaire was related to the social dimension of sustainability. The previously mentioned indicator sets were presented to participants to assess the social dimension of sustainability. These indicators were related to the themes of ***food security***, ***community development & interaction***, and ***educational functions***, as seen in Table 4.7.

Table 4.7 Indicators of Themes of Social Dimension

Dimensions	Themes	Indicators
Social	Food security	Provide access to healthy and fresh foods
		Enable organic production and farming
	Community development & interaction	Increase social interaction and cohesion between different groups
		Provide learning and training experiences for citizens
	Educational functions	Enhance awareness among citizens about food production by educational activities, like workshops, and courses
		Develop skill and practical knowledge regarding agriculture
		Connect to traditional practices and local knowledge with citizens

The first theme of the social dimension, ***food security***, aims to analyze whether urban agriculture activities provided participants access to healthy and fresh foods, and whether these foods were produced by organic farming. For that purpose, the first indicator asked participants whether they could access healthy and fresh foods from urban agriculture activities in case study areas. They evaluated access to healthy and fresh food by answering a question using a 5-point Likert scale, from 1 (strongly disagree) to 5 (strongly agree).

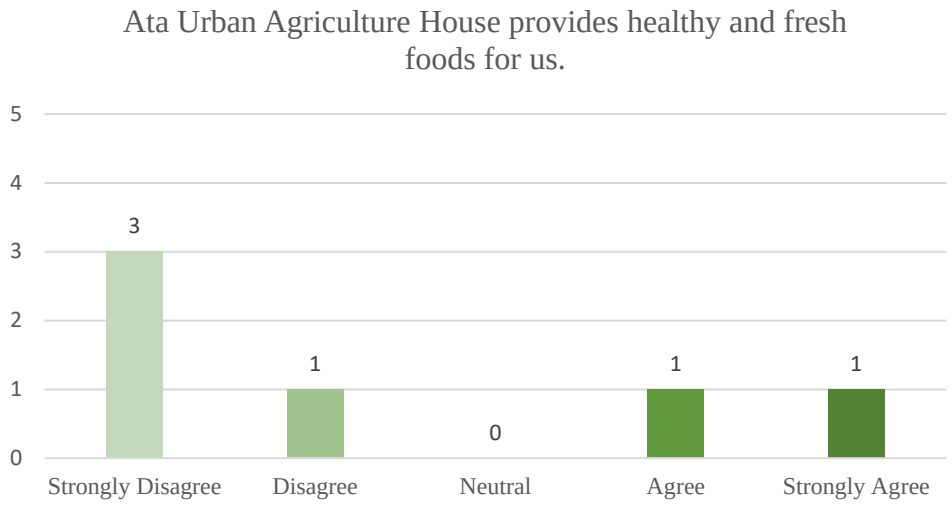
In Mutlukent Urban Agriculture House, 66% of participants strongly agreed, 3% of participants agreed, 13% of participants were neutral, 3% of participants disagreed, and 16% of participants strongly disagreed.



	Number of people	Ratio (%)
Strongly Disagree	5	16%
Disagree	1	3%
Neutral	4	13%
Agree	1	3%
Strongly Agree	21	66%
Total	*32*	*100%*

Figure 4.15. Results of indicator "providing healthy and fresh food" in the Mutlukent case.

In Ata Urban Agriculture House, 17% of participants strongly agreed, 17% of participants agreed, none of them was neutral, 17% of participants disagreed, and 50% of participants strongly disagreed.

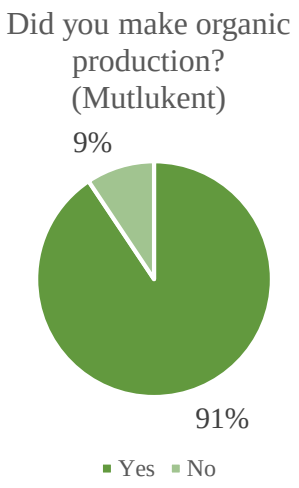


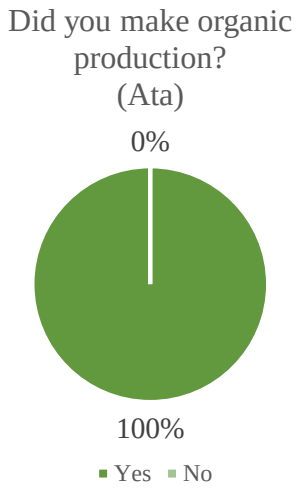
	Number of people	Ratio (%)
Strongly Disagree	3	50%
Disagree	1	17%
Neutral	0	0%
Agree	1	17%
Strongly Agree	1	17%
Total	*6*	*100%*

Figure 4.16. Results of indicator “providing healthy and fresh products” in the Ata case.

There were opposite opinions about access to healthy and fresh food in Mutlukent and Ata urban agriculture houses. The majority of participants of Mutlukent Urban Agriculture House agreed that they achieved access to healthy and fresh foods there. The 60% of participants owned a parcel in Mutlukent, so the participation in production process was high there. On the other hand, there is no total agreement about achieving access to healthy and fresh foods in terms of Ata Urban Agriculture House. This may be due to the limited participation in production processes at Ata Urban Agriculture House. In that case, 83% of participants did not own the parcels there, so they could not participate in production efficiently. This affected the food security contribution of urban agriculture negatively in Ata Urban Agriculture House.

As a second indicator, participants were asked whether these healthy and fresh foods were produced by organic farming. In Mutlukent Urban Agriculture House, 91% of participants stated that they practiced organic production, while 9% of participants did not. In Ata Urban Agriculture House, 100% of participants stated that they practice organic production.





	Number of people	Ratio (%)
Yes	29	91%
No	3	9%
Total	32	100%

	Number of people	Ratio (%)
Yes	6	100%
No	0	0%
Total	6	100%

Figure 4.17. Results of indicator “organic production”.

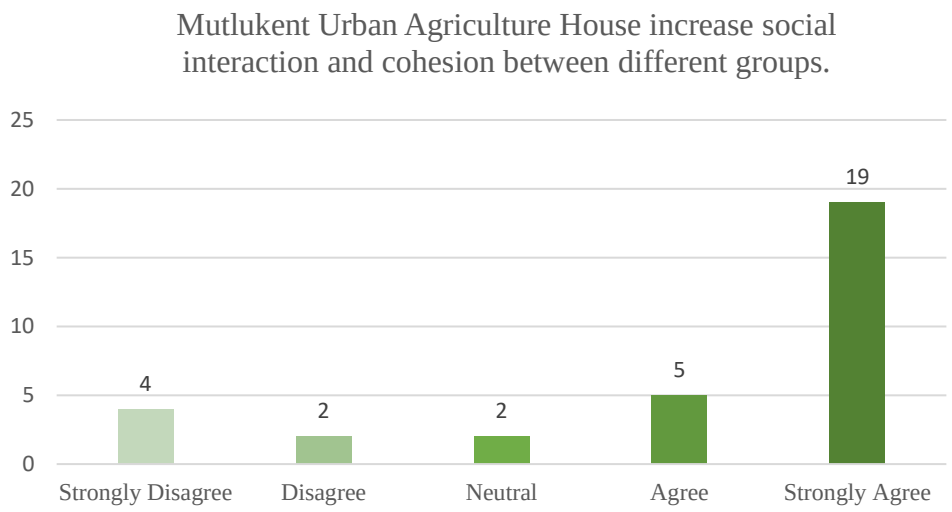
The majority of participants mentioned that they practice organic production. Therefore, these urban agriculture areas provide healthy foods for participants and contribute to food security by enabling organic production in both case study areas.

The second theme of social dimension, ***community development & interaction***, aimed to analyze the contributions of urban agriculture to community development and interaction. Many studies have shown that urban agriculture activities provide community development and empowerment by improving social interaction and cohesion between different social groups. That is why it was significant to assess the

contributions of urban agriculture activities to community development and interaction in case study areas.

For that purpose, as a first indicator, participants were asked whether these urban agriculture activities in the case study areas increased social interaction and cohesion between different groups. They evaluated that by answering a 5-point Likert scale question, from 1 (strongly disagree) to 5 (strongly agree).

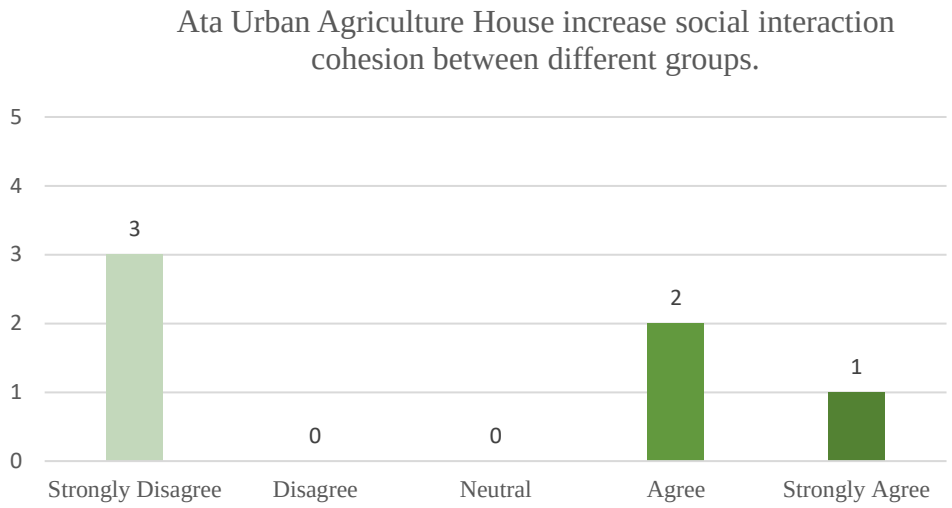
In Mutlukent Urban Agriculture House, 59% of participants strongly agreed, 16% of participants agreed, 6% of participants were neutral, 6% of participants disagreed, and 13% of participants strongly disagreed.



	Number of people	Ratio (%)
Strongly Disagree	4	13%
Disagree	2	6%
Neutral	2	6%
Agree	5	16%
Strongly Agree	19	59%
Total	*32*	*100%*

Figure 4.18. Results of indicator "increasing social interaction and cohesion between different groups" in the Mutlukent case.

In Ata Urban Agriculture House, 17% of participants strongly agreed, 33% of participants agreed, none of them were neutral or disagreed, and 50% of participants strongly disagreed.



	Number of people	Ratio (%)
Strongly Disagree	3	50%
Disagree	0	0%
Neutral	0	0%
Agree	2	33%
Strongly Agree	1	17%
Total	*6*	*100%*

Figure 4.19. Results of indicator "increasing social interaction and cohesion between different groups" in the Ata case.

There was strong agreement in Mutlukent Urban Agriculture House regarding increased social interaction and cohesion. When visiting the site, it was observed that many different social groups participated in production there. The municipality arranged special programs to encourage different social groups to gather in this place. Thanks to these programs, different social groups spent time together and shared experiences. Figure 4.20 shows examples of those programs. The students in the exchange program and kindergarten came to the urban agriculture area and shared experiences with participants there. These programs increased social

interaction and cohesion between them and contributed to the social dimension of sustainability.

Figure 4.20. Programs with different social groups. Source: Çankaya Municipality

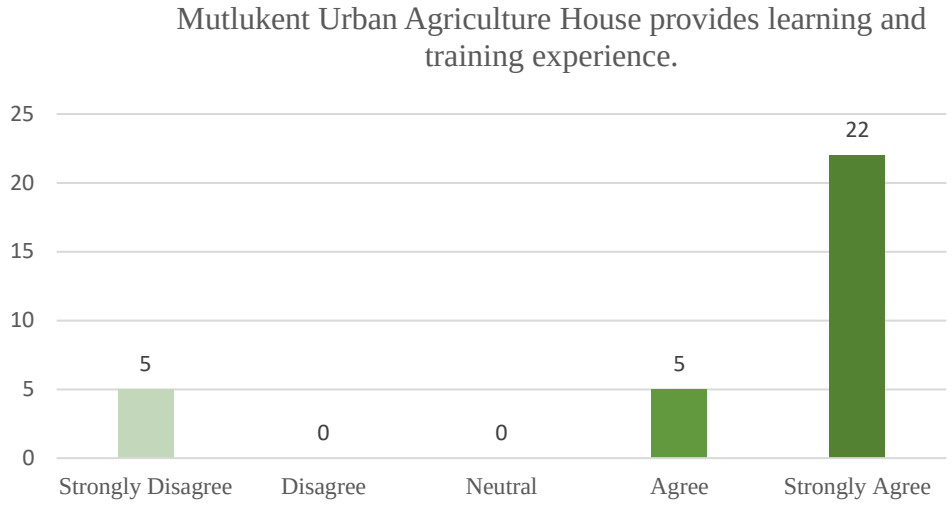
On the other hand, in terms of Ata Urban Agriculture House, there was not agreement about whether it had increased social interaction and cohesion between different social groups. There may be several reasons for these different results in the two urban agriculture houses. Ata Urban Agriculture House was established four years later than Mutlukent Urban Agriculture House. That is why social interaction and cohesion did not improve as much as at Mutlukent. In addition, Ata Urban Agriculture House did not contribute to the development of social interaction and cohesion as much as Mutlukent because the municipality did not organize the same programs there. Moreover, the spatial features also affect the development of social interaction and cohesion in urban agriculture areas. Mutlukent Urban Agriculture House is located in the Çayyolu district where there is a high level of interest in social interaction and cooperation (Gültekin, 2015). For instance, the participants also arranged some special days such as seed-harvest festival, pumpkin and tomato days, and so on. On those days, people came together and shared their seeds and harvests. They also made some food using harvested products and ate together. Then they cleaned the area and prepared it for next year's production. All of these activities improved the social interaction, cohesion, and cooperation. Therefore, the

contribution of urban agriculture to social interaction and cohesion was more visible than in the Ata case.

Figure 4.21. Breakfast activity in urban agriculture houses. The foods were made from the harvested products. Source: Çankaya Municipality

The second aim of the community development & interaction theme is assessing whether these urban agriculture areas provide community development. Thus, providing learning and training experiences for citizens was the second indicator in this theme. Participants evaluated achieving work and training experiences by answering a 5-point Likert scale question from 1 (strongly disagree) to 5 (strongly agree).

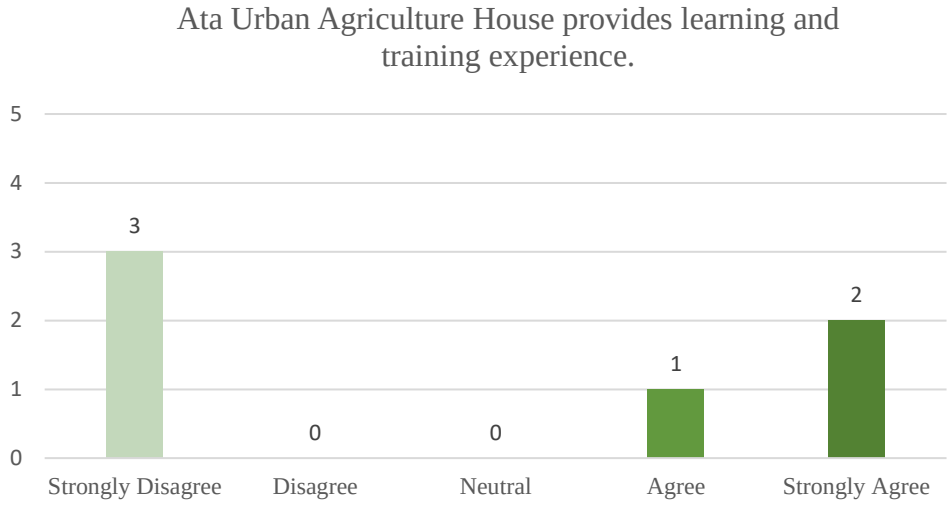
In Mutlukent Urban Agriculture House, 69% of participants strongly agreed, 16% of participants agreed, none of them were neutral or disagreed, and 16% of participants strongly disagreed.



	Number of people	Ratio (%)
Strongly Disagree	5	16%
Disagree	0	0%
Neutral	0	0%
Agree	5	16%
Strongly Agree	22	69%
Total	*32*	*100%*

Figure 4.22. Results of indicator "providing learning and training experiences" in the Mutlukent case.

In Ata Urban Agriculture House, 33% of participants strongly agreed, 17% of participants agreed, none of them were neutral or disagreed, and 50% of participants strongly disagreed.



	Number of people	Ratio (%)
Strongly Disagree	3	50%
Disagree	0	0%
Neutral	0	0%
Agree	1	17%
Strongly Agree	2	33%
Total	*6*	*100%*

Figure 4.23. Results of indicator "providing learning and training experience" in the Ata case.

Like the previous indicator, there was a total agreement in Mutlukent Urban Agriculture House, but not in the Ata case. These results were affected by the same factors as in the indicator of social interaction and cohesion.

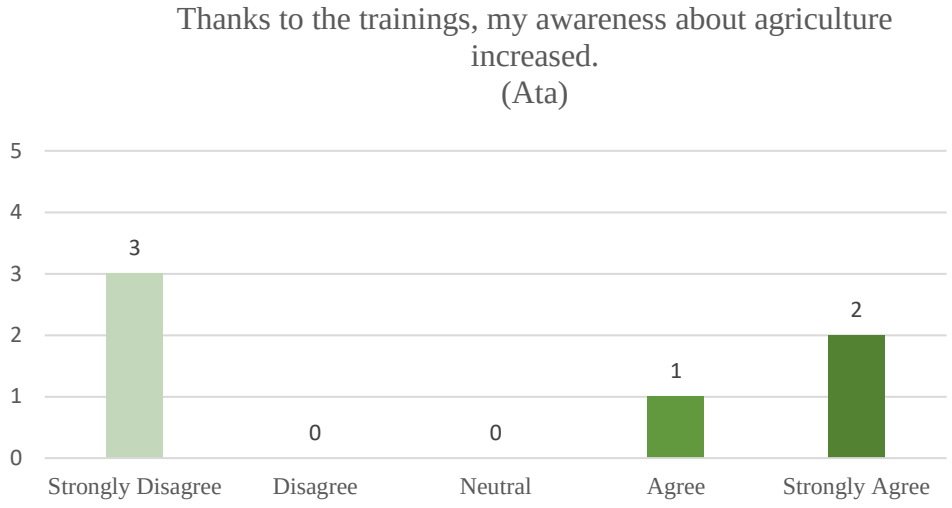
The third theme of social dimension, ***educational function***, aimed to analyze the contribution of urban agriculture activities to the agricultural education of participants. The obvious educational activities in the case study areas were workshops and courses. Therefore, as a first indicator, participants were asked whether these educational activities enhanced the awareness among citizens about food production. They answered a 5-point Likert scale question from 1 (strongly disagree) to 5 (strongly agree).

In Mutlukent Urban Agriculture House, 72% of participants strongly agreed, 13% of participants agreed, 3% of participants was neutral, none of them disagreed, and 16% of participants strongly disagreed.

	Number of people	Ratio (%)
Strongly Disagree	5	16%
Disagree	0	0%
Neutral	1	3%
Agree	3	13%
Strongly Agree	23	72%
Total	*32*	*100%*

Figure 4.24. Results of indicator "increasing awareness about agriculture" in the Mutlukent case.

In Ata Urban Agriculture House, 33% of participants strongly agreed, 17% of participants agreed, none of them were neutral or disagreed, and 50% of participants strongly disagreed.



	Number of people	Ratio (%)
Strongly Disagree	3	50%
Disagree	0	0%
Neutral	0	0%
Agree	1	17%
Strongly Agree	2	33%
Total	*6*	*100%*

Figure 4.25. Results of indicator "increasing awareness about agriculture" in the Ata case.

Çankaya Municipality offered an educational program in urban agriculture houses including the theoretical and practical training regarding basic vegetable cultivation and garden care as seen in Table 4.8. Some of the lectures were natural care for vegetables, natural plant protection methods, summer and autumn vegetable preparation and growing, pruning fruit trees, making compost at home and so on. Parcel owners could attend both theoretical and practical trainings, while non-parcel owners could attend only the theoretical ones. Therefore, parcel owners had a chance to apply the theoretical knowledge to practice. Although the same theoretical education program was followed in both urban agriculture houses, the awareness raising in Mutlukent case was more visible than Ata case. Because the percentage of parcel owners is low in Ata Urban Agriculture House, most of the participants were able to attend theoretical lessons but not participate in agricultural practices. Thus, it

can be concluded that the awareness raising was achieved more in urban agriculture practice more than theoretical lessons.

Table 4.8 Educational Programs of Urban Agriculture Houses

Lectures
What is the Importance of Local Seed?
How to Prepare the Environment for Growing Vegetables?
Vegetables Diseases
Natural Care for Vegetables
Natural Plant Protection Methods
Summer and Autumn Vegetable Preparation and Growing
Pruning of Fruit Trees
Vineyard Pruning
Grafting of Fruit Trees
Vertical Garden Techniques
Rainwater Collection
Making Compost at Home
Basic Beekeeping Training

The second indicator of the theme of educational function was related to improvement of skills and practical knowledge about agriculture. Participants answered a 5-point Likert scale question from 1 (strongly disagree) to 5 (strongly agree), whether their skills and knowledge have increased or not.

In Mutlukent Urban Agriculture House, 69% of participants strongly agreed, 13% of participants agreed, 3% of them was neutral none of them disagreed, and 16% of participants strongly disagreed.

	Number of people	Ratio (%)
Strongly Disagree	5	16%
Disagree	0	0%
Neutral	1	3%
Agree	4	13%
Strongly Agree	22	69%
Total	*32*	*100%*

Figure 4.26. Results of indicator "increasing skills and knowledge about agriculture" in the Mutlukent case.

In Ata Urban Agriculture House, 33% of participants strongly agreed, 17% of participants agreed, none of them were neutral or disagreed, and 50% of participants strongly disagreed.

	Number of people	Ratio (%)
Strongly Disagree	3	50%
Disagree	0	0%
Neutral	0	0%
Agree	1	17%
Strongly Agree	2	33%
Total	*6*	*100%*

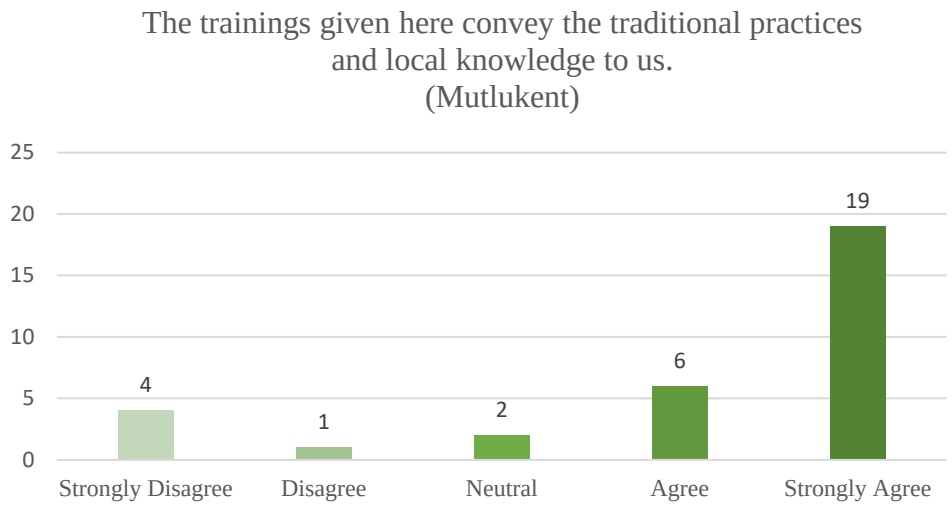
Figure 4.27. Results of indicator "increasing skills and knowledge about agriculture" in the Ata case.

The results of development of agricultural skills and knowledge were the same as the results of awareness raising. The development of agricultural skills and knowledge in Mutlukent case was more visible than Ata case. Because the percentage of parcel owners is low in Ata Urban Agriculture House, most of the participants were able to attend theoretical lessons but not participate in agricultural practices. Thus, it can be concluded that development of agricultural skills and knowledge was achieved more in urban agriculture practice more than theoretical lessons.

The third and the last indicator of the theme of educational function was related to connecting traditional practices and local knowledge to the citizens. This indicator tried to obtain information about whether the urban agriculture case study areas

provide this connection to the participants or not. Participants answered a 5-point Likert scale question from 1 (strongly disagree) to 5 (strongly agree).

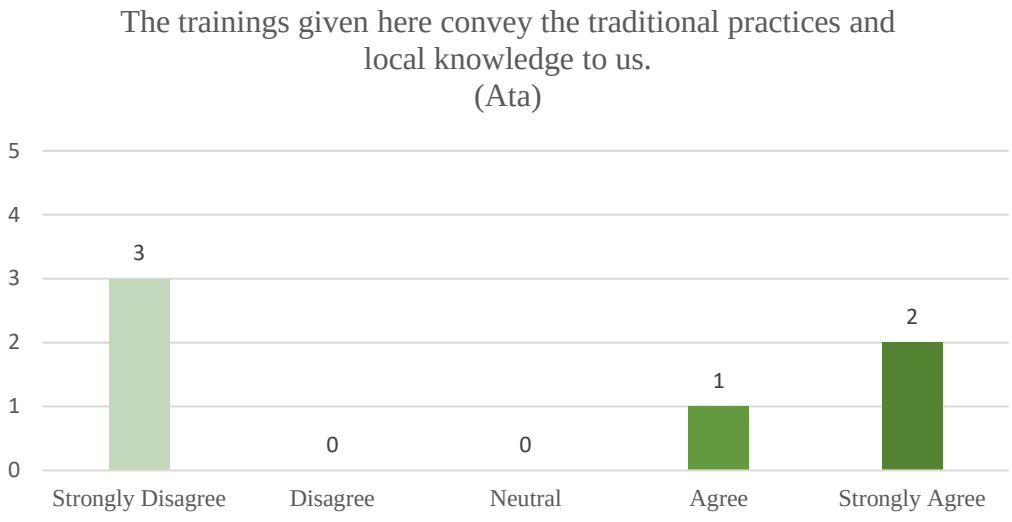
In Mutlukent Urban Agriculture House, 59% of participants strongly agreed, 19% of participants agreed, 6% of them were neutral 3% of them disagreed, and 13% of participants strongly disagreed.



	Number of people	Ratio (%)
Strongly Disagree	4	13%
Disagree	1	3%
Neutral	2	6%
Agree	6	19%
Strongly Agree	19	59%
Total	*32*	*100%*

Figure 4.28. Results of indicator "conveying the traditional practices and local knowledge to participants" in the Mutlukent case.

In Ata Urban Agriculture House, 33% of participants strongly agreed, 17% of participants agreed, none of them were neutral or disagreed, and 50% of participants strongly disagreed.



	Number of people	Ratio (%)
Strongly Disagree	3	50%
Disagree	0	0%
Neutral	0	0%
Agree	1	17%
Strongly Agree	2	33%
Total	*6*	*100%*

Figure 4.29. Results of indicator "conveying the traditional practices and local knowledge to participants" in the Ata case.

Participants of Mutlukent Urban Agriculture House mostly agreed that the trainings conveyed the traditional practices and local knowledge to them. The Municipality brought together local farmers with participants. Local farmers gave lectures in these meetings and talked about their traditional agricultural methods. The Figure 4.30 shows an example of these events.

On the other hand, the results were different in Ata Urban Agriculture House. Half of the participants agreed, while half of them did not, so there was no majority opinion there. The reason behind this could be a lack of participation in urban agriculture activities in Ata Mutlukent Urban Agriculture House. Therefore, not everyone was able to participate in the trainings where traditional methods were taught. Moreover, because of the low parcel owner ratio there, there was less opportunity to practise the traditional knowledge of food production processes.

Figure 4.30. Participants were learning the traditional methods from local farmer in Mutlukent Urban Agriculture House. (Source: Çankaya Municipality)

Moreover, the content analysis of open-ended questions showed that the most-mentioned issue regarding social dimension was "gaining knowledge". The mentioned key words related to gaining knowledge in social dimension constituted 30% of total results. Many participants stated that they gained significant knowledge about agriculture in the urban agriculture houses:

> *"I understood the importance of growing your own food locally. As a result of the short and concise training I received from experts in their fields, I learned that agriculture can also be done in cities. I had the opportunity to apply what I learned. I became a member of a community devoted to agriculture. In this way, I benefited from the knowledge sharing of people more experienced than me." (Participant 6, Mutlukent)*

> *"I learned about sustainable energy and organic agriculture from lectures here. I learned important topics from composting to rain harvesting, so these lectures increased my awareness and knowledge" (Participant 5, Ata)*

After the issue of gaining knowledge, the most-mentioned issues were "socialization, community interaction, sharing and experience." All of these issues were interrelated to each other because participants were able to socialize, interact and share in the activities of the urban agriculture houses. Many participants stated:

"The urban agriculture house brought together people who wanted to produce, learn and share." (Participant 16, Mutlukent)

"It provided the opportunity to communicate from different social groups." (Participant 26, Mutlukent)

"It provided communication and interaction between individuals from different social classes." (Participant 28, Mutlukent)

"I met new people here. We interact with each other about the practical knowledge that we applied in agricultural production. It was so beneficial." (Participant 30, Mutlukent)

"This place made significant contributions to meeting new and different people, sharing and getting information" (Participant 3, Ata)

The issues of "food security and food self-sufficiency" were the least-mentioned in terms of social sustainability. Participants stated that they learnt producing their own food and consequently they obtained healthier foods from their gardens:

"I started growing my own vegetables after attending events here." (Participant 19, Mutlukent)

"Thanks to trainings offered by the urban agriculture house, I was able to obtain healthier food and more crops from my own garden." (Participant 24, Mutlukent)

Table 4.9 Results of open-ended questions

Dimensions	Indicators	Frequency of Mention			Ratio
		Mutlukent	Ata	Total	
Economic	obtaining savings	12	-	12	10%
Social	gaining knowledge	28	8	36	30%
	socialization	18	2	20	16%
	community interaction	6	3	9	7%
	sharing	4	4	8	7%
	experience	6	-	6	5%
	food security	4	-	4	3%
	food self-sufficiency	1	-	1	1%
Environmental	increasing environmental awareness	11	-	11	9%
	increase agricultural awareness	-	6	6	5%
	recycling	3	-	3	2%
	clean production	2	-	2	2%
	providing green areas	2	-	2	2%
	waste management	1	1	2	2%
	Total	**98**	**24**	**122**	**100%**

All in all, the theme of education functions provided remarkable contributions to the social dimension of sustainability. As Dobbins et al. stated, educational activities of urban agriculture improved self-sufficiency, community engagement, agricultural knowledge, and agricultural experience. These educational activities were a strong motivational factor for citizens to join different community engagement activities and practice agriculture in an urban area (2020, p.359).

Hallett et al., stated that many urban agriculture areas give more importance to social aims, such as education and community development than financial ones. At the same time, they stated that the development of social programs could be a supporting tool for economic sustainability of urban agriculture areas (2016, p.92).

In other words, the general opinion of their study is that urban agriculture activities did not focus to financial issues. The strongest contribution and motivation of these activities are providing a place where people can learn food production in an urban area. Moreover, the majority of farmers engaged in urban agriculture are motivated by social goals (Dimitri et al., 2016, p.756).

Likewise, Mutlukent and Ata Urban Agriculture Houses provide social contributions more than economic ones. Their contributions to food security, community development & interaction, and education are the most visible and are recognized by the majority of participations.

4.4.5 Environmental Assessment

The fourth part of the questionnaire was related to the environmental dimension of sustainability. The previously mentioned indicator sets were presented to participants to assess the environmental dimension of sustainability. These indicators were related to the themes of waste management, clean production, and greening the cities, as seen in Table 4.10.

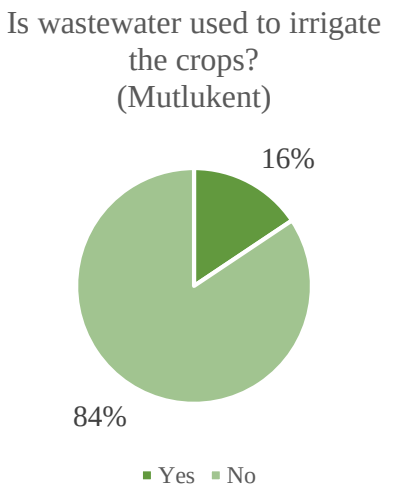
Table 4.10 Indicators of Themes of the Environmental Dimension

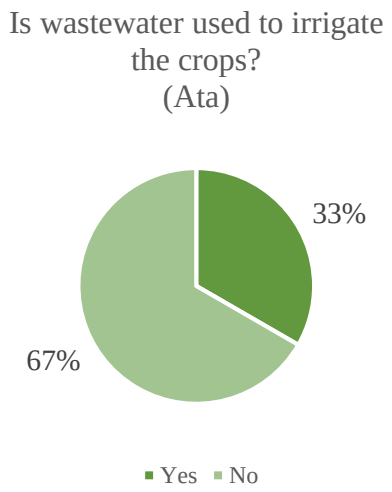
Dimension	Themes	Indicators
Environmental	Waste management	Use wastewater for irrigation Encourage recycling and reuse Use household and agricultural organic residues as a compost
	Clean production	Non-use of agrochemicals
	Greening the cities	Promote the green areas in a built environment Support connection between green areas and citizens

The first theme of the environmental dimension, ***waste management***, aimed to analyse the contributions of urban agriculture activities to waste management processes in case study areas. For that purpose, as a first indicator, irrigation systems, participants in the case study areas were asked whether they use wastewater or not.

In Mutlukent Urban Agriculture House, 84% of participants stated that they did not use wastewater for irrigation in urban agriculture activities there. Only 16% of participants stated that they used wastewater.

In Ata Urban Agriculture House, 67% of participants stated that they did not use wastewater for irrigation in urban agriculture activities there. Only 33% of participants stated that they used wastewater.





	Number of people	Ratio (%)
Yes	5	16%
No	27	84%
Total	32	100%

	Number of people	Ratio (%)
Yes	2	33%
No	4	67%
Total	6	100%

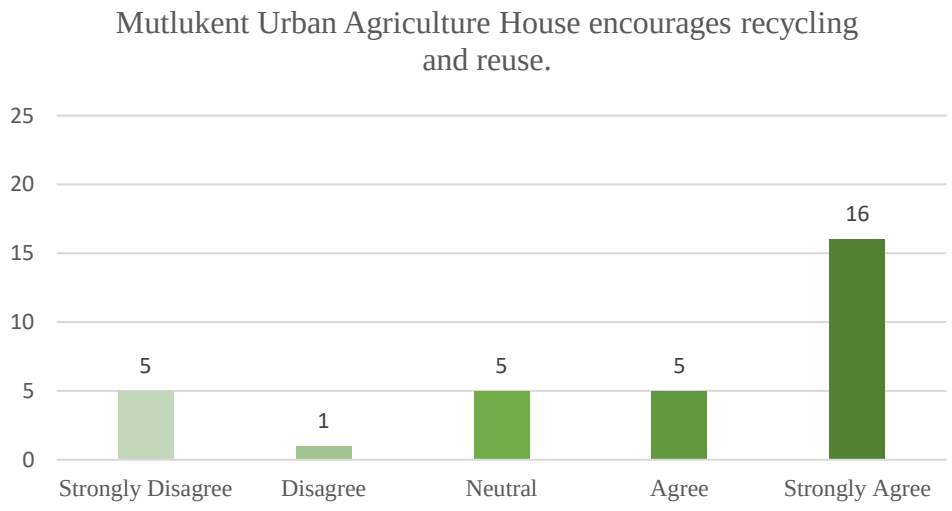
Figure 4.31. Results of indicator “using wastewater for irrigation”.

It was observed that there was not a proper system for using wastewater or rainwater in the case study areas. Therefore, most of the participants stated that they did not use wastewater or rainwater for irrigation. The participants, who stated that they did use wastewater or rainwater mentioned that they collected and used this water by

their own means. However, in interviews, municipality officials stated that they plan to establish a rainwater irrigation system in these urban agriculture houses.

Another indicator of the theme of waste management is encouraging recycling and reuse. Urban agriculture provides resource efficiency by recycling organic, inorganic and construction wastes. Therefore, participants were asked whether the urban agriculture houses encourage them to recycle and reuse.

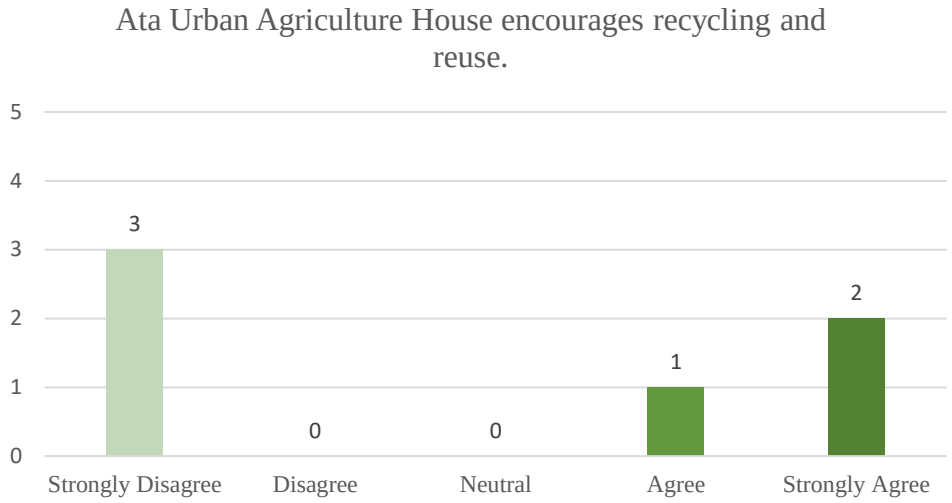
In Mutlukent Urban Agriculture House, 50% of participants strongly agreed, 16% of participants agreed, 16% of them were neutral 3% of them disagreed, and 16% of participants strongly disagreed.



	Number of people	Ratio (%)
Strongly Disagree	5	16%
Disagree	1	3%
Neutral	5	16%
Agree	5	16%
Strongly Agree	16	50%
Total	*32*	*100%*

Figure 4.32. Results of indicator "encouraging recycling and reuse" in the Mutlukent case.

In Ata Urban Agriculture House, 33% of participants strongly agreed, 17% of participants agreed, none of them were neutral or disagreed, and 50% of participants strongly disagreed.



	Number of people	Ratio (%)
Strongly Disagree	3	50%
Disagree	0	0%
Neutral	0	0%
Agree	1	17%
Strongly Agree	2	33%
Total	*6*	*100%*

Figure 4.33. Results of indicator "encouraging recycling and reuse" in the Ata case.

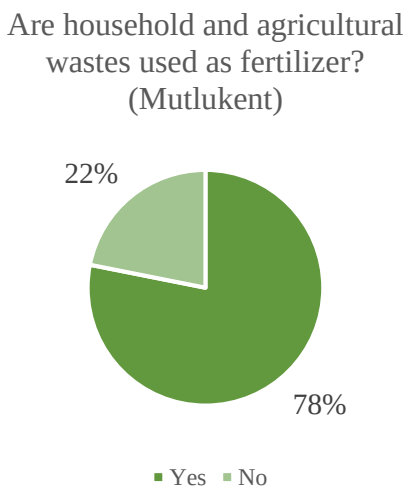
In Mutlukent Urban Agriculture House, most of the participants stated that these activities encouraged recycling and reuse. Also, when visiting this case study area, it was observed that there are many examples of recycling and reuse. The Figure 4.34 shows these examples: They were using plastic bottles to make greenhouses for plants, the metal pipes for tomato stakes, the white plastic pipes to grow strawberries inside. Again, there was not a majority of participants at Ata Urban Agriculture House who stated agreement with this, and these examples were not seen there.

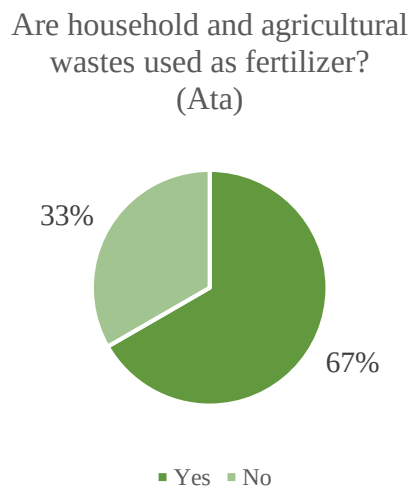
Figure 4.34. Examples of recycling and reuse of different materials in Mutlukent case study area. (Source: Personal Archive, 2020)

The last indicator of the theme of waste management is using household and agricultural organic residues for compost. Use of organic and household wastes as compost is often mentioned in literature in the relationship between urban agriculture and waste management. Therefore, participants were asked whether or not they used household and organic wastes as compost in these urban agriculture houses.

In Mutlukent Urban Agriculture House, 78% of participants stated that they use household and agricultural wastes as a fertilizer in urban agriculture activities there. Only 22% of participants stated that they did not.

In Ata Urban Agriculture House, 67% of participants stated that they use household and agricultural wastes as a fertilizer in urban agriculture activities there. Only 33% of participants stated that they did not.





	Number of people	Ratio (%)
Yes	25	78%
No	7	22%
Total	32	100%

	Number of people	Ratio (%)
Yes	4	67%
No	2	33%
Total	6	100%

Figure 4.35. Results of indicator "using household and agricultural wastes as fertilizer".

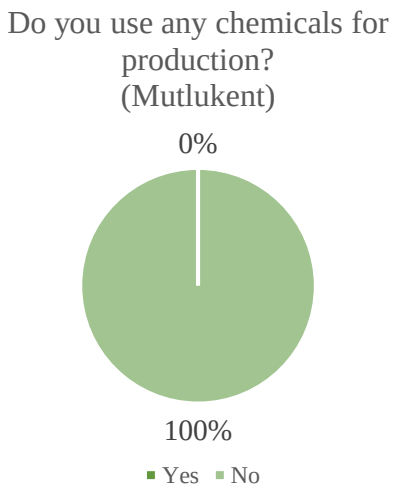
The majority of participants in the two urban agriculture houses stated that they use household and agricultural wastes as a fertilizer because there was a lecture about making compost from organic materials in the Municipality training programs. Participants mentioned that they learnt making the organic compost by recycling household wastes in these lectures:

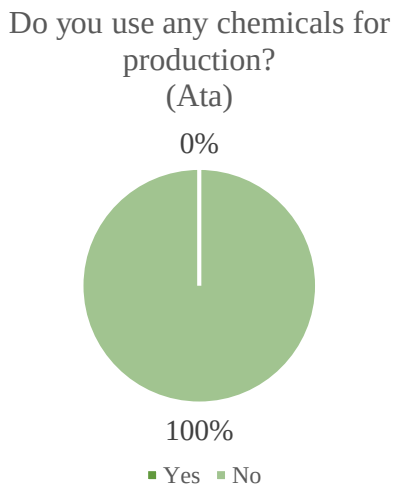
> *"I learned how to make compost here. Previously, I thought that household waste could not be recycled." (Participant 25, Mutlukent)*

Figure 4.36. Participants were making organic compost from agricultural wastes. Source: Çankaya Municipality.

The second theme of the environmental dimension is ***clean production.*** It aimed to analyse whether Mutlukent and Ata Urban Agriculture Houses support clean production or not. In light of literature review, non-use of agrochemicals supports clean production, which also supports food security in urban agriculture areas. Therefore, the usage of agrochemicals was analyzed as an indicator.

In Mutlukent Urban Agriculture House, all participants (32 participants) stated that they did not use any agrochemicals in urban agriculture activities there. Similarly, in Ata Urban Agriculture House, all participants (6 participants) stated that they did not use any agrochemicals in urban agriculture activities there.





	Number of people	Ratio (%)
Yes	0	0%
No	32	100%
Total	32	100%

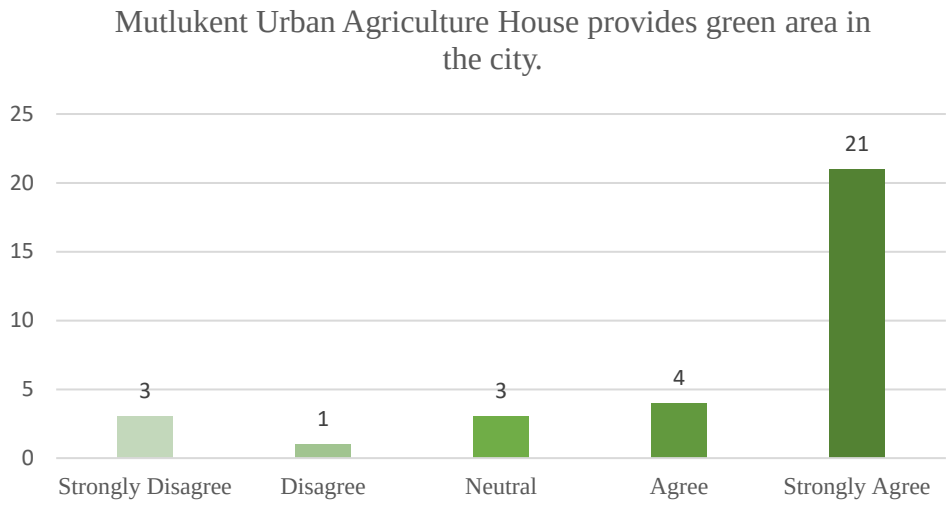
	Number of people	Ratio (%)
Yes	0	0%
No	6	100%
Total	6	100%

Figure 4.37. Results of indicator "using any chemicals for production".

All of the participants mentioned that they did not use any chemicals in case study areas. Therefore, Mutlukent and Ata Urban Agriculture Houses ensured clean production which contributed to the environmental dimension of sustainability in agricultural practices there.

The last theme of environmental dimension is related to the ***greening function*** of urban agriculture in cities. Urban agriculture areas are developed as green open areas, in many cases. The first indicator of this theme is promotion of green areas in a built environment.

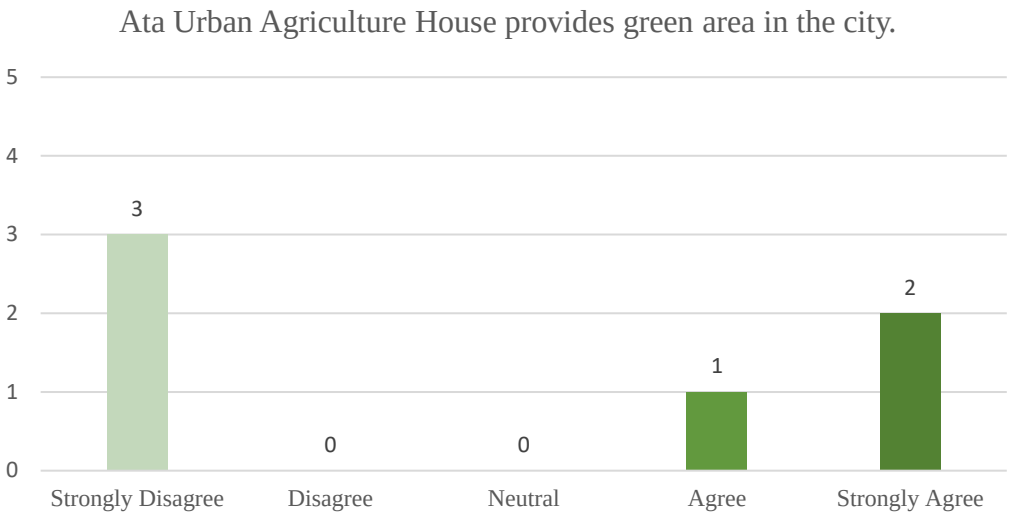
In Mutlukent Urban Agriculture House, 66% of participants strongly agreed, 13% of participants agreed, 9% of them were neutral 3% of them disagreed, and 9% of participants strongly disagreed.



	Number of people	Ratio (%)
Strongly Disagree	3	9%
Disagree	1	3%
Neutral	3	9%
Agree	4	13%
Strongly Agree	21	66%
Total	*32*	*100%*

Figure 4.38. Results of indicator "providing green area in the city" in the Mutlukent case.

In Ata Urban Agriculture House, 33% of participants strongly agreed, 17% of participants agreed, none of them were neutral or disagreed, and 50% of participants strongly disagreed.



	Number of people	Ratio (%)
Strongly Disagree	3	50%
Disagree	0	0%
Neutral	0	0%
Agree	1	17%
Strongly Agree	2	33%
Total	*6*	*100%*

Figure 4.39. Results of indicator "providing green area in the city" in the Ata case.

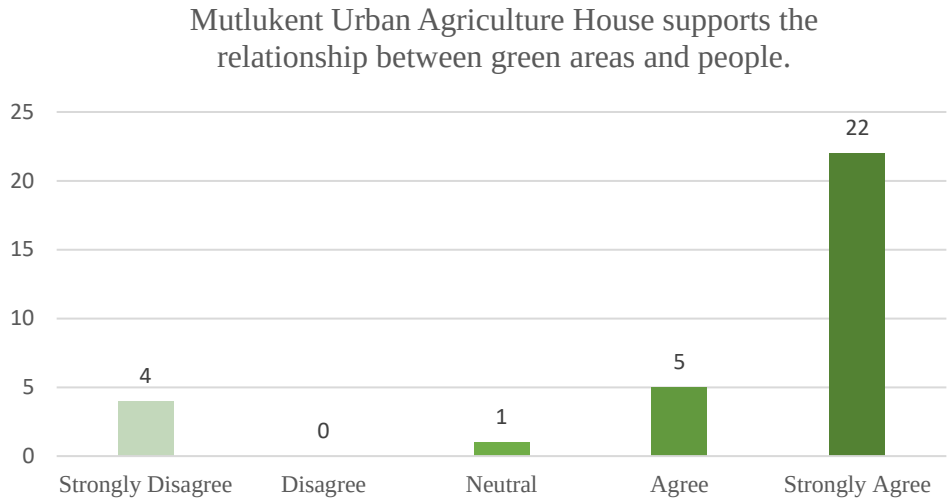
The majority of participants at the Mutlukent Urban Agriculture House agreed that urban agriculture areas provide green space in the city. They claim that:

> *"This offers us a life where nature is intertwined with city life, which has recently become quite a built environment." (Participant 26, Mutlukent)*

It was understood that participants at Mutlukent Urban Agriculture House observed that it was a green space in the city. However, participants of Ata Urban Agriculture House did not totally agree with this.

In addition to providing green areas, it is also important to support the relationship between these green areas and citizens. Many supporters of urban agriculture claim that it establishes the connection between people and nature. Therefore, as a second indicator, supporting the bond between green spaces and citizens was evaluated in the case studies.

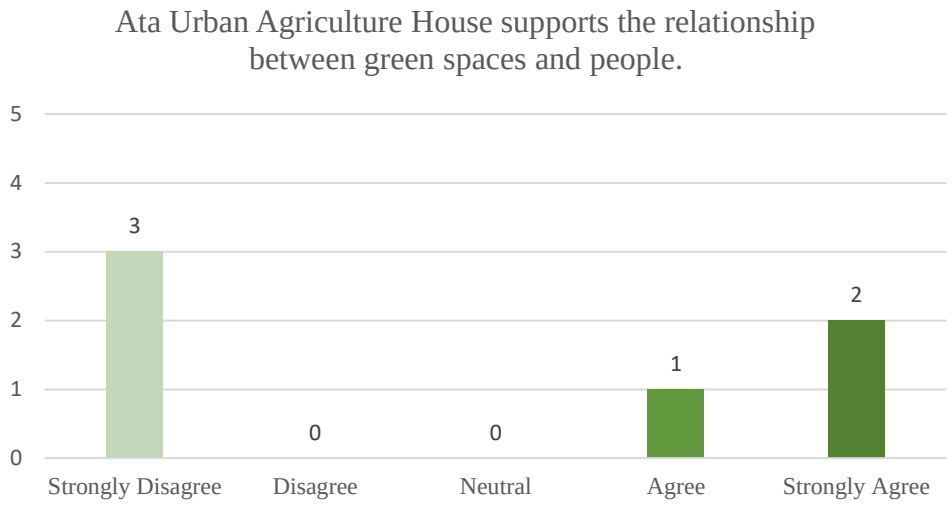
In Mutlukent Urban Agriculture House, 69% of participants strongly agreed, 16% of participants agreed, 3% of them were neutral 3% of them disagreed, and 9% of participants strongly disagreed.



	Number of people	Ratio (%)
Strongly Disagree	4	13%
Disagree	0	0%
Neutral	1	3%
Agree	5	16%
Strongly Agree	22	69%
Total	*32*	*100%*

Figure 4.40. Results of indicator "supporting the relationship between green areas and people" in the Mutlukent case.

In Ata Urban Agriculture House, 33% of participants strongly agreed, 17% of participants agreed, none of them were neutral or disagreed, and 50% of participants strongly disagreed.



	Number of people	Ratio (%)
Strongly Disagree	3	50%
Disagree	0	0%
Neutral	0	0%
Agree	1	17%
Strongly Agree	2	33%
Total	*6*	*100%*

Figure 4.41. Results of indicator "supporting the relationship between green areas and people" in the Ata case.

Again, the majority of participants of Mutlukent Urban Agriculture House agreed that urban agriculture areas support the relationship between green areas and citizens. They go there to be in open green space:

> "I come here because I can be in a greener and more natural environment." (Participants 31, Mutlukent)

However, participants of Ata Urban Agriculture House did not totally agree with this.

Moreover, the content analyses of open-ended questions showed that the most-mentioned issue was "increasing environmental and agricultural awareness". Participants stated that the training programs in urban agriculture houses increased their environmental and agricultural awareness:

"Our awareness of agriculture is increasing. It increases our sensitivity to the environment." (Participant 26, Mutlukent - Participant 2, Ata)

"I became more aware of the care and health of the surrounding plants." (Participant 27, Mutlukent)

"Even while looking at the trees around me, I realized that I was more conscious of how the tree should receive sunlight and how to increase yield with pruning." (Participant 7, Ata)

After these, "recycling, waste management, and clean production" were mentioned.

"We learned how to make fertilizer from waste." (Participant 7, Ata)

"I learned about compost. Previously, I thought that household waste could not be recycled." (Participant 25, Mutlukent)

"It contributed to the evaluation of domestic waste and recycling of water." (Participant 27, Mutlukent)

"We learned how our waste can be used." (Participant 12, Mutlukent)

"I have seen how agricultural production can be done efficiently without using chemical fertilizers and pesticides that harm the environment." (Participant 6, Mutlukent)

Finally, "providing green areas" is mentioned. Sarket et al. (2019) claim that urban agriculture improves the cities' environments by providing more green space. This idea was demonstrated by participants:

"It offers a greener and more natural environment for us." (Participant 31, Mutlukent)

The literature review showed that the most notable roles of urban agriculture in environmental sustainability is recycling and contributing to waste management. These environmental contribution roles of urban agriculture are also visible in case study areas.

Table 4.11 Results of open-ended questions

Dimensions	Indicators	Frequency of Mention			Ratio
		Mutlukent	Ata	Total	
Economic	obtaining savings	12	-	12	10%
Social	gaining knowledge	28	8	36	30%
	socialization	18	2	20	16%
	community interaction	6	3	9	7%
	sharing	4	4	8	7%
	experience	6	-	6	5%
	food security	4	-	4	3%
	food self-sufficiency	1	-	1	1%
Environmental	increasing environmental awareness	11	-	11	9%
	increase agricultural awareness	-	6	6	5%
	recycling	3	-	3	2%
	waste management	1	1	2	2%
	clean production	2	-	2	2%
	providing green areas	2	-	2	2%
	Total	**98**	**24**	**122**	**100%**

4.5 Discussion of Findings

In order to discuss the sustainability of urban agriculture, the thesis first defined the urban agriculture activities of Çankaya Municipality in light of the components of the COST definition in Chapter 4.3. The case study areas are located inside the city in dense urban areas, which is a basic feature of urban agriculture. Functionally, these activities could be defined as gardening activities that provide education and recreation for people. The market orientation of the urban agriculture houses is limited, mostly intended for household use. They are purposely planned, and their motivation is social and environmental concerns. Their actors are private non-

farmers, lecturers, and municipality officials. Their stakeholders are participants who attend the courses conducted in these areas. Thanks to this definition, it was noticed that the urban agriculture activities of Çankaya municipality are gardening activities that aim to provide education and recreation for citizens.

Table 4.12 The components of Urban Agriculture Houses of Çankaya Municipality.

Components	
Spatial	In dense urban areas
Functional	Community garden: education, social interaction, and recreation.
Market-orientation	Household usage
Origin	Purposely planned
Actor	Private non-farmers and lecturers
Motivation	Social and environmental concerns
Stakeholder	Participants

To assess the sustainability of urban agriculture activities of Çankaya Municipality, an interview and a questionnaire study were conducted. The main findings of these studies can be analyzed into three dimensions of sustainability: economic, social, and environmental.

The economic dimension of sustainability consists of themes of income generation, savings, and innovation, research, and entrepreneurship. **The theme of income generation** includes two indicators: provide a source of income and selling surplus production. These two indicators were not totally provided in the two case study areas. Urban agriculture activities of Çankaya Municipality did not provide a source of income for participants. Moreover, participants did not obtain any income by selling the surplus production there.

The theme of savings includes the indicator of partial savings through self-sufficiency. Participants of Mutlukent Urban Agriculture House did not agree that

this was provided. Half of the participants of Ata Urban Agriculture House agreed, while half of them did not. However, content analysis of the open-ended questions showed that one notable economic contribution of urban agriculture houses was providing partial savings. Participants stated that they obtained partial savings by consuming foods produced in the case study areas. Also, their food expenses were decreased in this way, and they were able to save some money.

The theme of innovation, research, and entrepreneurship consists of two indicators: the formation of new businesses after joining urban agriculture activities and using learnt information in innovative research areas. It was observed in interviews that these indicators were not realized in case study areas.

As a result, the contribution of urban agriculture activities of Çankaya Municipality to economic sustainability were found to be limited in both case study areas. These activities only provide partial savings through decreasing food expenses and consuming the produced foods.

The social dimension of sustainability consists of the themes of food security, community development & interaction, and educational functions. **The theme of food security** consists of two indicators: access to healthy and fresh foods, and organic production and farming. Access to healthy and fresh foods was provided in Mutlukent Urban Agriculture House, while it was not in Ata Urban Agriculture House. Organic production and farming were provided in both urban agriculture houses.

The theme of community development & interaction consists of two indicators: increase social interaction and cohesion between different groups, and provide work and training experiences for the participants. These two indicators were observed in Mutlukent Urban Agriculture House. On the other hand, even though the same educational and training program was held in Ata, the overall result shows that these indicators were not observed there.

The theme of educational functions consists of three indicators: enhancement of citizens' awareness of food production; skill development and practical knowledge regarding agriculture; connection to traditional practices and local knowledge. Again, all of these indicators were observed in Mutlukent Urban Agriculture house, while they were not in Ata.

As a result, the contribution of Çankaya Municipality's urban agriculture activities to social sustainability were found sufficient in Mutlukent Urban Agriculture House. However, these contributions were not sufficient in Ata Urban Agriculture House. According to the overall result, the indicator of organic production of the theme of food security was only observed in Mutlukent. Thus, this result was insufficient for the social sustainability of Ata Urban Agriculture House.

The environmental dimension of sustainability consists of themes of waste management, clean production, and greening the cities. **The theme of waste management** includes three indicators: using wastewater for irrigation, encouraging recycling and reuse, and using household and agricultural organic residues as a compost. Using wastewater for irrigation was not observed in either urban agriculture house. Encouraging recycling and reuse was only observed in Mutlukent Urban Agriculture House. Using household and agricultural organic residues as a compost was observed in both urban agriculture houses.

The theme of clean production consists of the indicator of non-use of agrochemicals. It was observed in both urban agriculture houses.

The theme of greening the cities consists of two indicators: promotion of green areas in a built environment, and supporting connection between green areas and citizens. These were observed in Mutlukent Urban Agriculture House, while they were not in Ata Urban Agriculture House.

As a result, the contributions of Çankaya Municipality's urban agriculture activities to environmental sustainability were found to be sufficient in the Mutlukent Urban

Agriculture House. On the other hand, these contributions were found to be limited in the Ata case.

Table 4.13 Main Findings

Dimensions	Themes	Indicators	Total Results	
			Mutlukent	Ata
Economic	Income generation	Provide a source of income	-	-
		Sell the surplus production	-	-
	Savings	Provide partial savings through self-sufficiency	-	-/+
	Innovation, research, and entrepreneurs hip	Form new businesses after joining urban agriculture activities	-	-
		Use learnt information in innovative research area	-	-
Social	Food security	Provide accessing healthy and fresh foods	+	-
		Enable organic production and farming	+	+
	Community development & interaction	Increase the social interaction and cohesion between different groups	+	-
		Provide learning and training experiences for citizens	+	-
	Educational functions	Enhance of the awareness among citizens about production of foods by educational activities like workshops and courses	+	-
		Develop skill and practical knowledge regarding agriculture	+	-
		Connect to traditional practices and local knowledge with citizens	+	-
Environmental	Waste management	Use wastewater for irrigation	-	-
		Encourage recycling and reuse	+	-
		Use households and agricultural organic residues as a compost	+	+
	Clean production	Non-use of agrochemicals	+	+
	Greening the cities	Promote of green areas in a built environment	+	-
		Support connection between green areas and citizens	+	-

CHAPTER 5

CONCLUSION

5.1 Concluding Remarks

The aim of this thesis is to analyze the relationship between urban agriculture and sustainability and offer a sustainability assessment framework in light of the literature review. So far, the relationship between sustainability and urban agriculture was established in a comprehensive literature review seen in Chapters 2 – 3. In addition, findings of the sustainability assessment of Mutlukent and Ata Urban Agriculture Houses were presented in Chapter 4. The conclusion discusses an association between literature reviews and findings.

As mentioned in the literature review, sustainability was defined as providing harmony and interaction among the economic, social, and environmental aspects in the Brundtland Report. Moreover, The Earth Summit suggested that the balance of these three aspects is necessary for sustainable development. Therefore, in this thesis, sustainability is considered to be harmony, interaction, and balance of the economic, social, and environmental dimensions. Sustainability in the case of urban agriculture areas was assessed using a set of themes and indicators related to the economic, social, and environmental dimensions of sustainability. The results showed that the social and environmental dimensions were in harmony and interaction with each other. There is a mutual relationship between the social and environmental contributions of urban agriculture in the case study areas. The contributions of urban agriculture to the social dimension ensured contributions to the environmental dimensions and vice versa. For instance, the agricultural training programs helped to raise agricultural awareness among the participants, and this supported the connection between green areas and citizens. Also, non-use of agrochemicals and making compost from organic residues ensured the indicators of food security:

providing healthy foods and enabling organic production. Moreover, participants learnt the traditional practices and local knowledge so they could fight against plant disease without using agrochemicals. These examples showed that the social and environmental dimensions were in harmony and interacting with each other.

Table 5.1 The harmony and interaction between social and environmental dimensions of sustainability in case study areas.

Dimension	Themes	Indicators
Social	Food security	Provide accessing healthy and fresh foods
		Enable organic production and farming
	Community development & interaction	Increase the social interaction and cohesion between different groups
		Provide learning and training experiences for citizens
	Educational functions	Enhance of the awareness among citizens about production of foods by educational activities like workshops and courses
		Develop skill and practical knowledge regarding agriculture
		Connect to traditional practices and local knowledge with citizens

Indicators	Themes	Dimension
Use wastewater for irrigation	Waste management	Environmental
Encourage recycling and reuse		
Use households and agricultural organic residues as a compost		
Non-use of agrochemicals	Clean production	
Promote of green areas in a built environment	Greening the cities	
Support connection between green areas and citizens		

The economic dimension was not part of this harmony and interaction process. The savings provided could only be defined as part of the economic contribution occurring as a result of consuming produced foods in household. Therefore, the balance of three dimensions of sustainability was not ensured in the case study areas. Actually, it was not the aim of the Municipality to ensure the economic dimensions of sustainability when they established these Urban Agriculture Houses. Their aim was focused on the social aspects of municipal services: offering educational programs for citizens while providing a place where they could spend time. These aims were also demonstrated by COST's classification. The functional component of these urban agriculture areas included the community garden's functions: education, social interaction, and recreation. Moreover, the motivations of these case study areas included social and environmental concerns. These ensured the social dimension of sustainability, which therefore also ensured the environmental dimension, even if the environmental dimension was not emphasized as much as the social dimension at the beginning of the projects.

Not focusing on the economic aspects was not an issue for these case study projects, because there was a paradigm shift in the urban agriculture approaches mentioned in Section 2.2.2. The social-environmental viewpoint of urban agriculture was dominating more than the economic viewpoint. Likewise, the social-environmental viewpoint was emphasized more than economic ones in case study areas. In other words, it was expected that the contributions regarding the social and environmental dimensions of sustainability would be more visible than economic ones, due to both the paradigm shift of the context of urban agriculture and the Municipality's aims in case study areas.

Figure 5.1. Paradigm shift in the definitions and context of urban agriculture.

To conclude, it can be deducted from this study that urban agricultural production in case study areas is conducted in a limited urban land by aiming providing social programs by offering education and recreation opportunities, therefore the food production is small-scale. This leads to limited contribution to economic dimension of sustainability and the harmony, interaction, and balance of three dimension of sustainability did not ensured. Hallett et al., stated that many urban agriculture areas give more importance to social aims, such as education and community development than financial ones. The Çankaya Municipality has same aims therefore, the result showed that social and environmental contributions are more visible than economic ones in these case study areas. At the same time, they stated that the development of social programs could be a supporting tool for the economic sustainability of urban agriculture areas (2016, p.92). The Municipality may try to support the economic sustainability of urban agriculture in this way in future years. For instance, the produced foods in urban agriculture houses can be sold in the Municipality's local markets in different areas. Moreover, they can increase production by enlarging the urban agriculture areas from the community garden scale to peri-urban farm scale. These of course increase the economic contributions of urban agriculture.

To sum up, only targeting the social and environmental contributions of urban agriculture areas is not wrong, but some initiatives can be developed to missing parts of economic contribution. As mentioned before, Nogeire-McRae et al. claim that growing food in urban areas is positively correlated with raising awareness of food production (Nogeire-McRae et al., 2018). Awareness raising enables people to decide more consciously about their food system (Azunre et al., 2019, p. 111). Therefore, as a first step, the social and environmental contributions increase the awareness, interest, and curiosity of people. Thus, people are becoming more willing to participate in large scale urban agriculture activities. However, for completely ensuring the sustainability of urban agriculture activities, we should ensure harmony, interaction, and balance of all three dimensions of sustainability. After that, Municipalities can ensure this by supporting the social and environmental contributions that were experienced so far. The next part presents some

recommendations for ensuring harmony, interaction, and balance of the economic, social, and environmental dimension of sustainability.

5.2 Recommendations for the Future of Urban Agriculture

This research showed that urban agriculture activities are new in Turkey. Most of them were established by targeting the social aspects. However, to make an efficient contribution to sustainability, more comprehensive actions are needed for developing urban agriculture in the cities. These actions should also ensure harmony, interaction, and balance of the three dimensions of sustainability.

Urban, Peri-Urban, and Rural Agriculture Linkages: One of the major constraints to applications of urban agriculture is the lack of space in urban areas for growing food (Deelstra & Girardet, 2000, p.47). The problem of lack of space was also mentioned by municipality officials in interviews. Because of this, food production did not increase enough to be sufficient for economic purposes. The current small-scale urban agriculture activities alone cannot provide sufficient contributions to the economic, social, and environmental dimensions of sustainability. It should be linked with urban, peri-urban and rural scales. This thesis showed that contributions of urban agriculture are more related with social and environmental dimensions of sustainability. Because the area that produces food is limited in urban areas, the production scale also had to be small. Thus, the economic contributions of urban agriculture remained limited in the case study areas. This may be solved by creating actions that ensure urban, peri-urban, and rural agriculture linkages. As a result of these linkages, while urban agriculture contributes more to the social and environmental dimensions of sustainability, peri-urban and rural agriculture contribute more to economic sustainability. The Çankaya Municipality plans to establish an urban farm located in periphery of Ankara. It may be possible to take actions that ensure all economic, social and environmental dimensions of sustainability on such big scale.

Promoting urban agriculture: Private and public actors should cooperate to promote urban agriculture in cities. Municipalities can provide access to publicly owned unused lands for agricultural purposes inside urban areas. The local market orientation can also be ensured with these lands. Production can be increased, and they can sell in the Municipality's local market. Moreover, there are examples in the literature of arrangements that provide tax advantages to landowners to temporarily allow their vacant land to be used for urban agriculture (Walker, 2016, p.171). The significant problem mentioned by municipality officials was to find areas for urban agriculture, which could be solved by encouraging people to use their vacant land by offering such tax advantages.

Integrating urban agriculture into land-use plans: According to Azunre et al. (2019), urban agriculture can only be sustained when it is consciously integrated into the city land use planning and zoning processes. This is one of the most important actions that ensure the continuity of urban agriculture's contributions to sustainability. With the new urban agriculture projects of Ankara and Çankaya Municipality, urban agriculture takes new places in the urban areas, which will increase the efficiency of the contributions of urban agriculture to sustainability.

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APPENDICES

A. Interview Questions

Information about urban agriculture studies and practices in Çankaya district:

1. Could you give some information about urban agriculture studies and practices in Çankaya district?
2. What is your aim in urban agriculture studies?
3. Who are the actors in these studies? Have you cooperated with any private, NGO or public institution?
4. Who attends Urban Agriculture Houses? (Women, children, elderly participants, etc.)
5. How do the materials using in agricultural activities in Urban Agriculture Houses obtained?
6. What kind of trainings are given in Urban Agriculture Houses?
7. Did any problems encountered during the implementation of the project?
8. What are the benefits you have obtained as a result of these studies? Can you evaluate it economically, socially and environmentally?
9. Do you have any future projects related to urban agriculture? What are they?

Economic sustainability:

10. As a result of the studies, do you provide any income generation or new employment area to the participants? (Especially for women and non-workers)
11. How are the products produced as a result of the applications use? Does each participant use their own product? Are the products sold anywhere?
12. Do the participants save economically as a result of these practices?
13. Has anyone established a new company as a result of the urban agriculture practices?

14. Is the learned information used in research related to agriculture?
15. What are the other contributions of Urban Agriculture Houses in terms of economic aspects?

Social sustainability:

16. Do these practices provide healthy and fresh products to the participants?
17. Do you make organic production in Urban Agriculture Houses?
18. Can we say that community development and interaction increased as a result of urban agricultural practices?
19. Has social cohesion and cooperation between different groups increased as a result of urban agriculture activities?
20. Do urban farming practices enable people to work and learn?
21. Has agricultural awareness increased among the participants? Do you organize any trainings to increase this awareness?
22. Do you use traditional methods and local knowledge?
23. What are the other contributions of Urban Agriculture Houses in terms of social aspects?

Environmental sustainability:

24. How do you get the water you need for urban agriculture? Do you use wastewater?
25. Do you encourage recycling and reuse? How?
26. Do you use fertilizers during applications? Does the fertilizer you use consist of household-agricultural waste?
27. Do you use any chemicals while farming?
28. Do you use local seeds?
29. Do you think you support green areas in the city thanks to urban agriculture practices?
30. Is the relationship between green spaces and citizens supported by these practices?
31. What are the other contributions of Urban Agriculture Houses in terms of environmental aspects?

B. Survey Questions

ÇANKAYA URBAN AGRICULTURAL PRACTICES

Survey Information: Within the scope of the thesis titled "Assessment of the Sustainability of Urban Agriculture: The Case of Ankara, Çankaya" conducted at the Middle East Technical University, Graduate School of Natural and Applied Sciences, Department of City Planning, the urban agriculture practices in Çankaya district are evaluated in terms of sustainability. This survey, which was conducted within the scope of the study, includes questions on economic, social and environmental issues related to Urban and Agriculture Houses in Çankaya district. The answers to the questions will be kept confidential and will only be evaluated within the scope of this thesis.

Thank you for your contribution.

Ş. Başak Dogan

General Information

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1. Please mark which Urban Agriculture House that you attend.

   () Ata Urban Agriculture House ( ) Mutlukent Urban Agriculture House

2. Please write year that you attend.

   ……..

3. Please specify the parcel owner status

   () Parcel owner

   () Non-parcel owner

4. Gender

   () Female

   () Male

5. Age

() 10-25

() 26-45

() 46-65

() 65+

6. Education

() Primary school

() High School

() University

() Master

() PhD

7. Please write your profession

…….

8. Working Status

() Working

() Not working

() Retired

Economic Sustainability

---

9. Did you obtain any income as a result of urban agriculture practices?

() Yes

() No

10. How do you use produced products?

……

……...

11. Did you sell the products to somewhere? If sold, please specify where.

() Yes. ……..

() No

12. Did you obtain some savings as a result of these practices?

() Yes

() No

13. What are the other economic contributions of Urban Agriculture House?
……
……
……
……

Social Sustainability

14. Did you make organic production in Urban Agriculture House?

() Yes

() No

15. Could you rate the following statements about Urban Agriculture House from 1 to 5?
(1: Strongly disagree. 2: Disagree. 3: Undecided. 4: Agree. 5: Strongly Agree.)

	1	2	3	4	5
Urban Agriculture House provides healthy and fresh products for us.					
Urban Agriculture House increase social interaction and cohesion between different groups.					
Urban Agriculture House provides a learning and training experiences					

	1	2	3	4	5
Thanks to the trainings, my awareness about agriculture increased.					
Thanks to the trainings, my skills and knowledge about agriculture have increased.					
The trainings given here convey the traditional practices and local knowledge to us.					

16. What are the other economic contributions of Urban Agriculture House?
……
……
……
……

Environmental Sustainability

17. Is wastewater used to irrigate the crops?

() Yes

() No

18. Are household and agricultural wastes used as fertilizer?

() Yes

() No

19. Do you use any chemicals for production?

() Yes

() No

20. Could you rate the following statements about Urban Agriculture House from 1 to 5?
(1: Strongly disagree. 2: Disagree. 3: Undecided. 4: Agree. 5: Strongly Agree.)

	1	2	3	4	5
Urban Agriculture House encourages recycling and reuse.					
Urban Agriculture House provides green area in the city.					
Urban Agriculture House supports the relationship between green areas and people.					

What are the other environmental contributions of Urban Agriculture House?
……
……
……
……

C. Approval of the METU Ethics Committee

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16 MART 2020

Konu: Değerlendirme Sonucu

Gönderen: ODTÜ İnsan Araştırmaları Etik Kurulu (İAEK)

İlgi: İnsan Araştırmaları Etik Kurulu Başvurusu

Sayın Prof.Dr. Serap KAYASÜ

Danışmanlığını yaptığınız **Şeyma Başak POLAT'ın "Kentsel Tarımın Sürdürülebilirliğinin Değerlendirilmesi: Çankaya, Ankara Örneği"** başlıklı araştırması İnsan Araştırmaları Etik Kurulu tarafından uygun görülmüş ve **128 ODTU 2020** protokol numarası ile onaylanmıştır.

Saygılarımızla bilgilerinize sunarız.

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