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New Approaches on Urban Agriculture: A Case Study in Ataköy

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Abstract: In today's world, cities are developing and expanding rapidly. One of the critical factors of this growth is migration from rural areas to cities. As migration to the urban areas increases, the city needs to grow its resources to be sufficient. According to the 2019 statements made by TUIK (Türkiye İstatistik Kurumu), the city that received the most immigration in Turkey was Istanbul with a rate of 42.5%. Urban agriculture is enhancing the capacity of urban resilience. This study aims to examine the concept of urban agriculture in the context of sustainability and examine practical examples especially from Ataköy, Bakırköy in a comparable style. Idle industrial areas or vacant lots and urban agriculture potentials are examined based on the R-URBAN strategy through methodologies of literature review and feasibility and field studies that carried out in Ataköy. A scenario produced and an implementation model has been developed for Ataköy in the context of urban agriculture at the basis of R-URBAN strategy.

Keywords: Urban Agriculture, R-URBAN strategy, Sustainability, Ataköy, Industrial Area Transformation

1.Introduction

As migration to urban environment increases and resources are consumed more, urban resistance decreases. This situation brings the issue of urban sustainability. The ability of a city to be self-sufficient is a crucial factor. An independent city that produces its energy and food can be developed in terms of sustainability. When it comes to producing own food in the city, the concept of urban agriculture appears. Urban agriculture includes private and community gardens and contains fruit, vegetable, fowl production, and fish farming activities for local consumption and sale (Rasouli, 2012; Wei and Jones 2022; Jansma and Werteim-Heck, 2021; Kontothanasis, 2017).

Cities that are economically and ecologically dependent on external sources fail in terms of sustainability. Considerable losses occur during the transportation of external food products. These losses are reflected in the carbon footprint, the price of the product, and the consumer. According to Aslan and Demir (2016), Istanbul can produce only 19% of its annual plant food consumption. This can be considered as proof that Istanbul is dependent in the food sector. Food coming to the city passes through more than one point. In this chain orderly manufacturer, intermediary, broker for the 1st region, shipper, broker in the 2nd region, market and finally the customer comes. The price of the product increases by 2.8 times (Figure1).

Figure 1: *Product Price Chain from Manufacturer to Consumer (modified from URL-2, 2017)*

The carbon dioxide gas emitted during the transportation of the products should also be taken into account.26% of the world's emissions originate from the Food Industry. 18% of this is due to the transportation of food to cities (Poore and Nemecek, 2018). The figure 1 above schematizing the adding cost processes from producerer to customer.

conception and a life style initiatedas "produce what we consume and consume what we produce" by the philosopher Andre Gorz. Self-food production and consumption, social collaboration and local networks are formed through those activities with an emphasis on sustainability (URL-3, 2021). The results of a research study by Roles-Valencia et al. (2011), also validates our explanations above. According to the study, enormous advantages

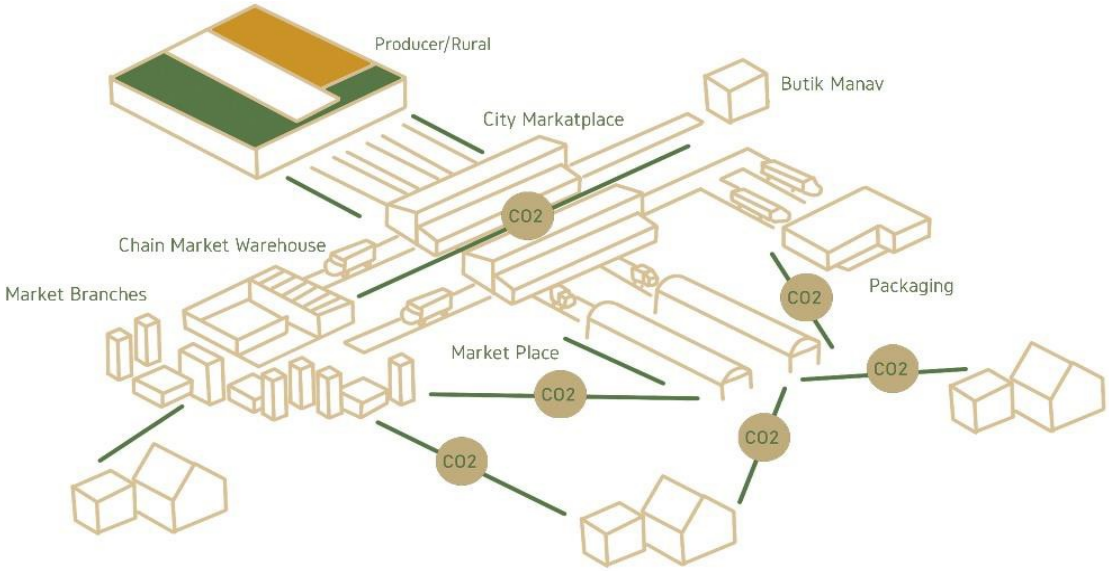

Figure 2: *From Production to Consumption in Food/State Axis (Modified from Okudan and Gürcan,2018)*

According to TUIK (URL-1,2019), the total greenhouse gas emission in Turkey was 506.1 Mt CO_2. When calculated in percentages, it appears that only 23.1 Mt CO_2 was emitted in food sector transportation. When all this information is considered, it is a fact that the concept of urban agriculture will contribute to sustainability both economically and ecologically. In this manner a new

were noted in the practice of urban agriculture techniques in a residential dwelling in Ohio, U.S. They lead to the selective recycling of waste materials that are generated by the ton, in the production of high quality 100% organic food (Roles-Valencia et al., 2011). This new approach is called as "R-URBAN" strategy. R-URBAN is a strategy that explores the possibilities of enhancing the capacity of

urban resilience by introducing network of residents in economy, housing, urban agriculture and culture (URL-3, 2021). This new approach is interiorized for sustainability also. There are 4 main issues that R-URBAN containing. AgroCite that we focused on for this study is including urban.

- AgroCité – a unit of urban agriculture which consists of a micro-experimental farm, community gardens, educational and cultural spaces and devices for energy production, composting and rainwater recycling (URL-3, 2021; Roles-Valencia et al., 2011).
- RecyLab – a recycling and green building constructed around a series of equipment for the recycling of urban waste and turning them into materials for eco-construction (URL-3, 2021).
- EcoHab – a residential unit, cooperative and ecological consisting of a number of experimental units and community spaces which in part are self-built (URL-3, 2021).
- AnimaLab – a domestic farm located in the Agrocité, bend of micro-structure like beehive and chicken coop. The productions are integrating in the local distribution network through the store local shop of the agroCité (URL-3, 2021).

R-URBAN enables the citizens to come together socially with production and creates recreation areas. No substanceis wasted in the ecologically created input-output cycle. The products are sold in local markets, the residues of the products are composted in the recycling areas and sent back to the soil for reproducing stage on the field. The cycle is obviously self-sufficient in a city network.

2.Material and the Methodology

Ataköy is the material of this case study. Ataköy located in Bakırköy Municipality, close to Bosphorus canal at the south east part of European side in İstanbul (Figure 3). In Ataköy the resident plan including different kinds of settlements as different block apartments. Mostly green areas take place at the layout of Ataköy and public spaces take place in a considerable amount (Figure 4).

There are two main subjects of the methodology, that are literature review and field

Figure 3: *Ataköy's location in İstanbul (Ezgi Duman, 2022)*

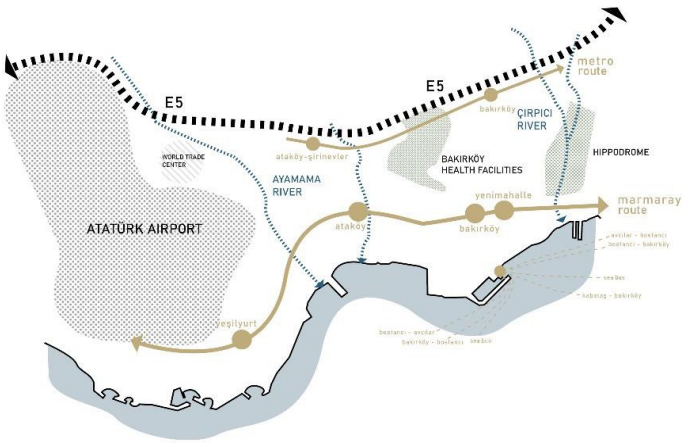

Figure 4: *Ataköy's layout plan (Ezgi Duman, 2022)*

study at the Ataköy. Literature review contains urban agriculture state both in Turkey and in the world and their processes in time. The field study examines the urban agriculture activities in Ataköy and vacant lots that are examined and feasibility studies conducted at the field study which are suitable for urban agriculture activities. Especially at pandemic situation it was obvious that urban agriculture activities increased and gained more importance with the food production reason and relaxation reason. Mostly local and individual attempts attracted attention in this field. A scenario produced for practices by considering R-URBAN strategy to create a model for future applications of urban agriculture by considering sustainability.

3.Literature Review

3.1.Urban Agriculture Examples and Practices from the World

Urban agriculture was first defined as agriculture producing perishable products as vegetables, animal products, and flowers, in the peri-urban area. As the world is undergoing rapid urbanization, great pressure is being placed on the food supply and urban environment, especially in fast-developing cities (Yan et al., 2022). Urban agriculture studies in recent years show that urban agriculture not only focuses on food production and different styles but also on how to realize the various functions of urban agriculture. In addition, urban agriculture related sustainability and the water-energy-food nexus have become emerging research topics. Besides, The University of Kassel, Chinese Academy of Sciences, and University of Freiburg are the most productive research institutions in the field of urban agriculture. The top-five most influential countries on urban agriculture activities are the Unites States, Germany, the United Kingdom, Italy, and China, of which the Unites States plays a central role in the cooperative linkage between countries.

Different types of urban agriculture are tried as new approaches as soilless techniques as in the example of vertical agriculture. Today, examples of vertical farming can be seen all over the world. The idea of farming in city centers has begun to appeal to most people. Although the idea of producing in skyscrapers in metropolises, which is one of the goals of vertical agriculture, has not yet received enough attention at the industrial level, the systems used in vertical agriculture are constantly renewing themselves with the continuous development of technology and reveals that the idea may be realized in different ways in the future (Bingöl, 2015). Skygreens Singapur is a kind of vertical agriculture project that had been implemented in 2012. A giant agricultural skyscraper consisting of 38 floors and 120 gardens. 500 kilograms of vegetables are produced per day with hydroponic, soilless farming methodology, which corresponds to a total of 3.65 hectares of land. While the fresh products collected are sent to supermarkets and markets without waiting, they are served to the public and the gases emitted by the plants are eliminated. Skygreens' officials and the Municipality of Singapore, who are very pleased with the results they have achieved, aim to increase the production capacity to 2 tons by building three more garden towers in the near future and then sell the vegetables they produce to the countries in the nearby region (Figure 5).

Figure 5: *Skygreens (URL-4, 2018)*

Another urban agriculture example from the U.S. is Gotham Greens. Gotham Greens offers its products for sale in 40 different states. The enterprise produces food 365 days a year with hydroponic system in locations close to the city

center. Gotham Greens presents different solutions according to the difficulties of indoor spaces in the production process. Growing agricultural products indoors, Gotham Greens produces with less energy consumption and less waste. Instead of using pesticides or chemical pesticides, Gotham Greens prefers to benefit from permaculture. In this sense, ladybugs and worms are also involved in the process. It currently offers packaged greens, salads, dressings and salad bowls to its users (Figure 6)

Figure 6: *Gotham Greens (URL-5,2022)*

3.2.Urban Agriculture Examples and Practices from Turkey-İstanbul

There are areas where urban agriculture is carried out in Istanbul. Istanbul has still preserved gardens as Fenerbahçe Community Garden, Şenay and Gülsüman Public Garden and orchards as Yedikule Gardens, Roma Gardens, Kuzguncuk Gardens (Figure 7-8). Although these initiatives do not have the potential to make an effective contribution to Istanbul's food consumption; they can inspire new projects to be developed to strengthen urban agriculture (GreenPeace, 2020). Kuzguncuk Bostan is a protected area and it is one of the last gardens of Istanbul, which has survived until today with its history of approximately seven hundred years. An environmental project for the bostan, which was last rented by Üsküdar Municipality in 2014; was prepared and implemented as a result of the meetings between the residents of the neighbourhood, the local authority's office, and the municipality officials. (Ademoğlu, 2016). In 2015, the 16.5-decare sized Kuzguncuk Garden was opened garden to visits of both Kuzguncuk and Istanbul residents. Bostan is divided into 115 separate parcels and 50 parcels of which are reserved for the use of the people of Kuzguncuk. The remaining parcels were given to schools and information offices. It also includes walking paths around the bostan area. Besides the garden, there is an area where children play and families socialize. In fact, open-air cinema screenings take place on some nights in Kuzguncuk Bostan. The agricultural lands in the garden are cultivated for food purposes in accordance with the traditional garden idea. At the Kuzguncuk Bostan, localseeds are used and chemical fertilizers and supports are not used. In Kuzguncuk Bostan, authorities try to combine ecologic methodologies with economy and socialization to achieve sustainability.

Figure 7: *Kuzguncuk Gardens (URL-6, 2021)*

Figure 8: *Roma Gardens in Cihangir (Photo: Şat, 2022)*

Yedikule City Gardens, named after the seven towers at the southern end of Theodosius' old city walls, can be considered as one of the remaining important green areas of the densely built and populated historical peninsula in Istanbul (Figure 9). Yedikule City Gardens are critical part of the universally protected UNESCO World Heritage Istanbul, along the Theodosian Walls, has managed to survive until today as theoldest agricultural land with a history of more than 1500 years. Production within Yedikule City Gardens links with many retail markets and city bazaars such as Fatih, Kocamustafapaşa, Karagümrük, Şehremini, as well as several local neighborhoods. This connection forms a kind of socio-economic and commercial network of daily life. The operation of Yedikule's present-day city gardens and the collection of products are similar to the traditional methods of the past. Especially the famous local products which are peculiar to the area are Yedikule lettuce and Langa cucumber are still produced as well as cabbage, beetroot, carrot, and onion. As an important cultural landscape, Yedikule City Gardens provide important information about agricultural technology, human relations, and how they treated nature in Byzantine and Ottoman times. (Durusoy and Cihanger, 2016)

4.Field study Results

4.1.Urban Agriculture Practices in Ataköy

The project area Ataköy is a settlement in Bakırköy district of Istanbul. It can be considered as one of the first settlements established by planning from the past to the present. Ataköy, that is closed to Atatürk International Airport, has been developing since 1950, became a popular settlement. In the scope of the field study urban agriculture alternatives in Ataköy is investigated. old hobby gardens and unused vacant lands as a

Figure 9: *Yedikule Gardens (URL-7, 2017)*

part from industrial areas are examined with their urban agricultural area potential.

When we look at the urban agriculture history of Ataköy, the significant application is hobby gardens. The hobby gardens established by the Municipality in 2001 have become the focus of attention of the public. Ataköy residents cultivated vegetables/fruits such as tomatoes, peppers, eggplant, lettuce, and strawberries in these 25 square meters of gardens with a capacity of approximately 1500 people (Figure 10). These gardens, which have users of all ages and socio-economic cultures, have succeeded in both socializing and supporting the city ecologically. However, with the decision taken in 2009, the gardens were demolished and today it stands as a vacant lot. In retrospect, with the huge green public areas, between block apartment lives and with the higher population of retirees; it is an undeniable fact that Ataköy residents needed those areas for urban agriculture practices.

Figure 10: *Ataköy Hobby Gardens (URL-8, 2009)*

Figure 11: *Agricultural production at the public space of the block apartments (Photo: Şat, 2022)*

4.2.Urban Agricultural Potentials of Ataköy and the Idle areas

Ataköy and Bakırköy have hosted many production areas from past to present. These production areas were not only on agriculture but also on the industry. In this part of the study, these production areas in Ataköy that can be used for the urban agriculture (Figure 12).

The structures of some of the industrial buildings in Ataköy are still standing, while the structures of some of them are in ruins. Ispirtohane and Baruthane are areas that were later restored and their buildings are still standing. Today, Ispirtohane is open to use as a cultural center, while Baruthane is available to use as a Nation's Garden. The buildings of the Acid and Oil factories were demolished, and a shopping mall was built in place of the oil factory. The Basmahane, textile, and yarn factory, on the other hand, are structures whose

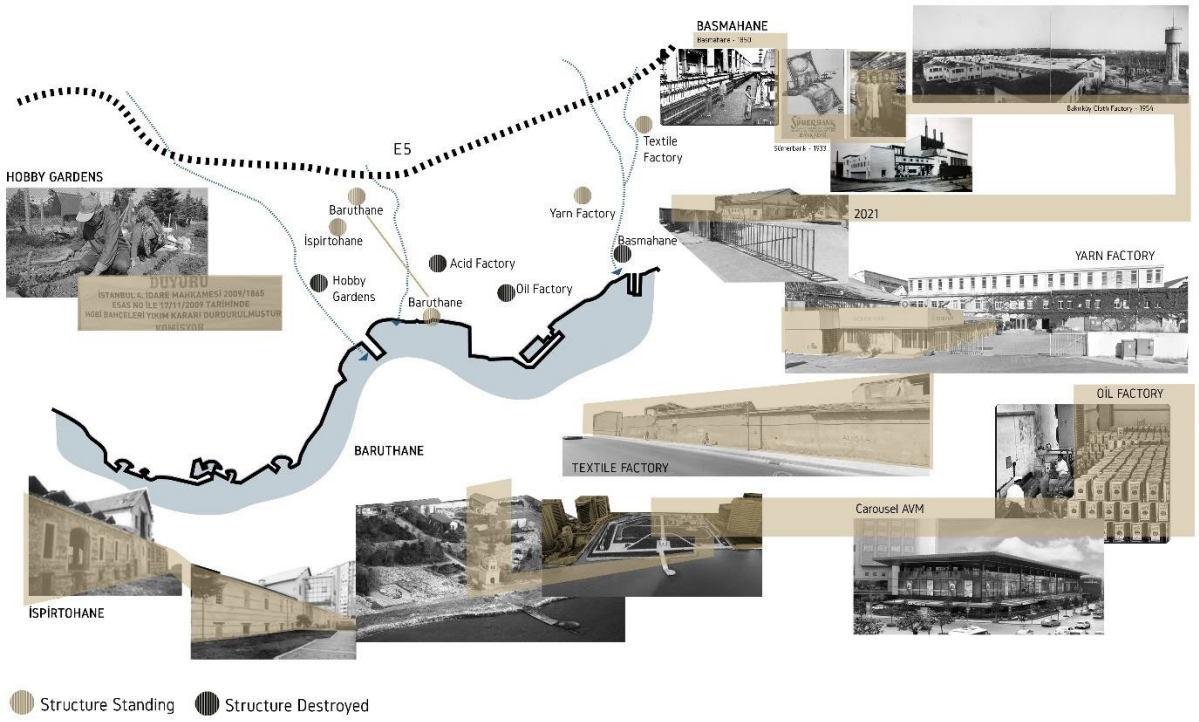

Figure 12: *Production Pattern texture of Bakırköy and Ataköy (Modified from URL-9, 2020)*

buildings are still standing. These 3 areas are critical for the proposal because the strategies were found to be correct to apply especially to these points. In Figure 12, brief information about the places and past of the areas in Ataköy is seen.

Ataköy has a potential for R-URBAN agriculture activities. Before the idle areas had been settled, the relationship with water was considered. The activity areas in the R-URBAN strategy are adapted to those idle areas and vacant lots in Ataköy and wanted to modified for urban agriculture activities as in the R-URBAN strategy. The most significant issue for the R-URBAN strategy was the cycle that the inputs and outputs follow themselves in a repetitive way which is sustainable. The cycle with its details is explained in the image below (Figure 13).

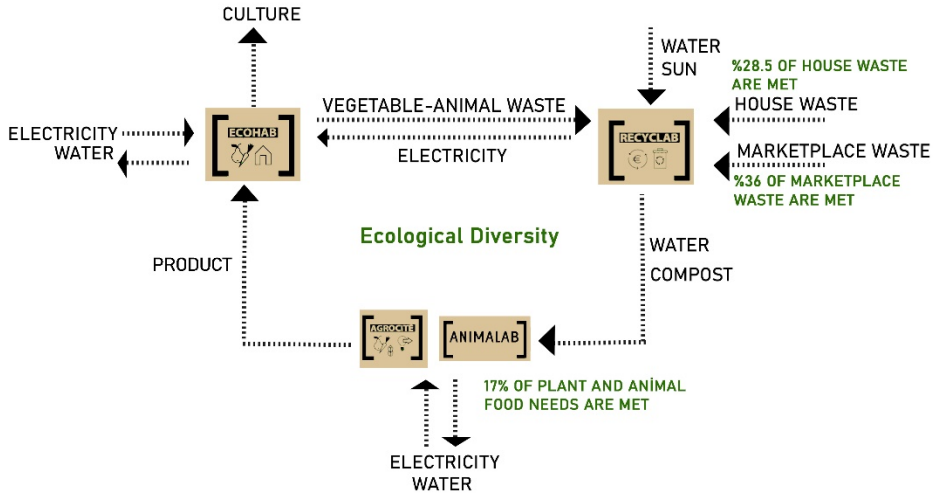

Figure 13: *Urban Ecological Cycle Diagram (modified from R-URBAN Strategies)*

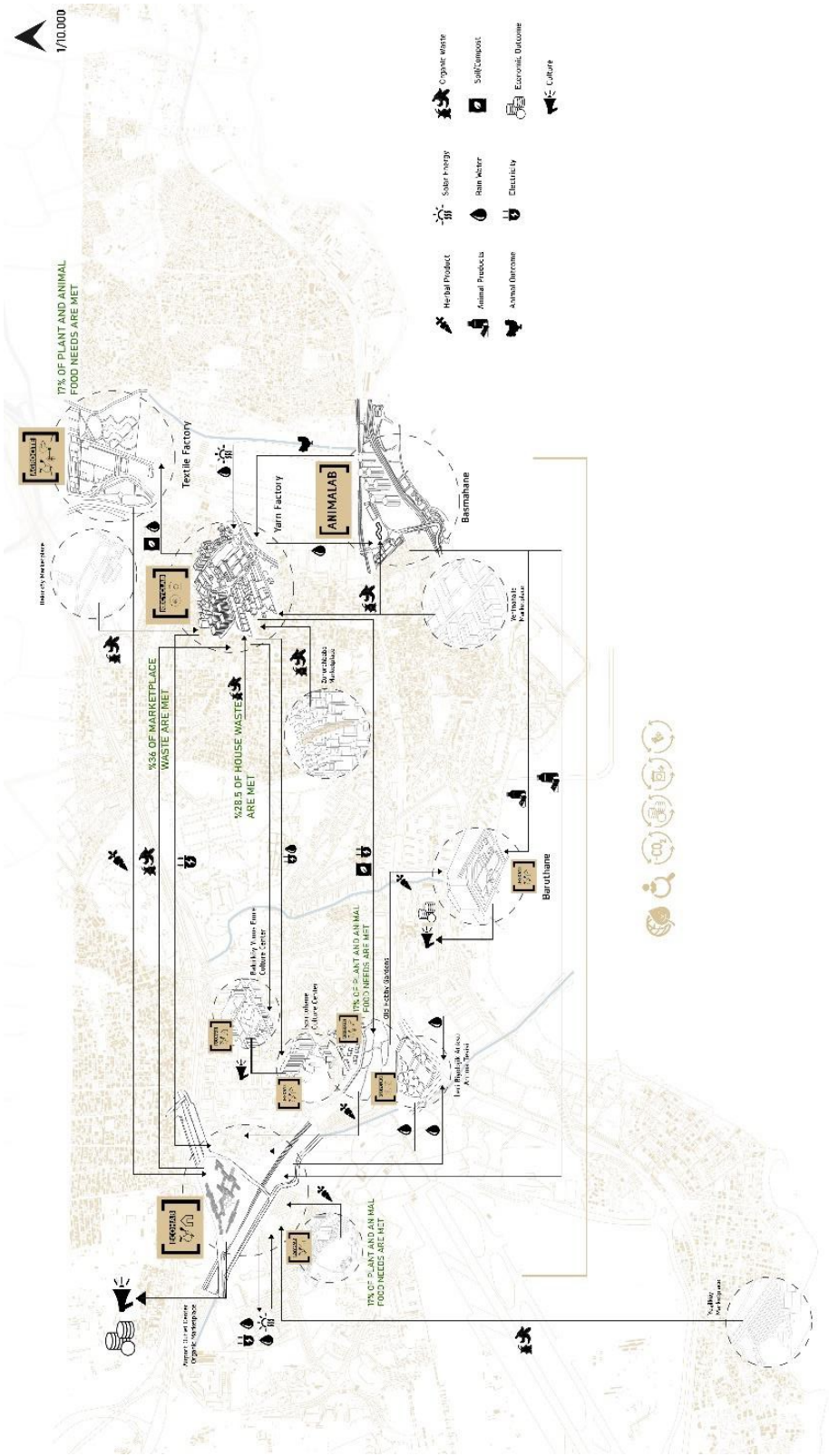

Figure 14: *Mind set of Ataköy Scenario based on R-URBAN*

The textile factory has seen suitable for AgroCite. It was decided that it would be more appropriate to produce in this area due to its relationship with the creek and the parks on both sides. AgroCité is designed to promote and support the dynamics of urban agriculture. Provides production for market areas. The area may include an urban agricultural farm, common gardens for neighborhood residents, an educational garden, a common greenhouse for plants and seedlings, rainwater harvesting equipment, crop treatment, solar energy and biogas, aquaculture crops and agricultural short circuits. The field's inputs include compost from Recycle lab. The outputs of the field are agricultural products that are produced and sent to the market.

Anima lab is located in the printing room. Anima lab is a micro-scale domestic farm that produces milk and dairy products, eggs. It includes a chicken coop, an area for milk producing animals, worm farm for feeding chickens, a dairy production area, storage area. Animal lab was developed with a pedagogical and ecological purpose. Animal production is integrated into the local distribution network and reused or sold through Markets. The yarn factory will be used for recycle lab. In addition to the R-URBAN strategy, recycle lab is designed to compost for the recycling of household waste into the soil to produce composts. Wastes from surrounding markets and homes are collected and recycled at this point. Tons of organic fertilizer to be obtained are distributed to AgroCite, citizens, parks, and gardens. These points have been determined as the main points for agricultural activities and prototypes can be reproduced in Ataköy and Bakırköy. For example, AgroCite can be applied to the point where the old hobby gardens are located. Production can be started in the idle and vacant lots near the Atatürk Airport.

5. Discussion

When we examine the scientific papers on urban agriculture; total of 605 papers were published from 2001 to 2021 (Yan et al., 2022). The number of published papers increased substantially year by year. Even this increasing demand can show this subject's importance especially for the future. Some negative effects also observed by the research groups from the aspect of urban agriculture. Some urban agriculture productions need more energy especially for lighting and temperature regulation than the conventional food production.

You can see the trends on urban agriculture and findings comparable at the table below (Dorr et al., 2021).

Table 1: *Some key trends and findings on different types of Urban Agriculture (UA) (Modified from Dorret al., 2021).*

UA types andelements	**Findings**
Indoor systems	Higher yield, higher climate change impact, higher energy use. Energy for lighting and temperature regulation, and greenhouse structure, were large sources of impact. Most results for herbs, tomatoes, vegetables, and leafy greens. Results varied based on ground–rooftop setting.
Open-air systems	Lower yield, lower climate change impact, lower energy use. Larger range of important sources of impact.
Intra-urban agriculture	Larger range of production system types. Smaller range of crop types. More resultsfrom UA case studies.
Peri-urban agriculture	Less varied production system types (mostly open-air, soil-based, ground-based). Larger range of crop types. More results from the literature and from conventional agriculture.
Research systems	Higher yield, higher climate change impacts. Almost the only system type with very large impacts. High quality and reliable data, but innovative, sub-optimized, and unrepresentative systems often studied.
Water use	Direct water use (mostly irrigation) was available for about 25% of systems. Water use was often higher for UA than conventional agriculture, although results varied widely.
Energy use	Cumulative energy demand was relatively high. Open-air, soil-based systems had the lowest energy demand

Despite positive or negative results, urban agriculture developing with new trends and try to find out a solution for healthy food supply especially for the citizens in a sustainable way. On the other hand, as the new trend of vertical farming, soilless farming or aquaponics production; including the risk of contamination. In this point hygiene issues come forth and the water used at the production should under control and be detected regularly for its mineral and chemical contents.

6. Recommendations and Conclusion

Different scenarios should be considered in the city to minimize the destructions in the development and growth of the city to increase the urban resilience. One of these scenarios/strategies is the concept of urban agriculture. When we examined the R-URBAN application, which is one of the best examples of the approach of urban agriculture, it is definite that the strategy can improve the city in economic ecologic and social ways. It reduces external dependency economically, and at this point, it balances the price gap from producer to consumer and creates new job opportunities. It enables the citizens to come together socially with production and creates recreation areas. No substance is wasted in the ecologically created input-output cycle. The products are sold in local markets, the residues of the products are composted in the recycling areas and sent back to the soil for reproducing stage on the field. The cycle is obviously self-sufficient in a city network. When Ataköy is examined at this point, it is suitable with its vacant lot areas also. The scenario for Ataköy is proposed in vacant lots that are linked to the strategy. According to the conclusions of wei and Jones' research (2022); urban agricultural practices which viewed as a socio-material assemblage respond to urban pressures and livelihood demands, and importantly, catalyze and drive innovative thinking on urban governance in terms of integrating urban agriculture into local development practices and outcomes (Wei and Jones, 2022). Urban agriculture practices enhancing the relation between food and people (Wei and Jones, 2022; Kontothanasis, 2017). Also ın R-URBAN approach, recycling and reusing methodology is adopted with an increasing demand, as the results of a research study of Rojas-Valencia et al. (2011); some organic waste solids and waste waters that successfully used in the production of %100 organic food which is suitable with the sustainable implementation (Rojas-Valencia et al. (2011). Taking everything into account, it is crucial to make applications for sustainability in ecologic, economic and social aspects on urban agriculture in Ataköy. To achieve this; local management teams with local government should provide education programs for practisers in order to help them on their productions, planning vacant lots as the practice areas, minimizing the negative environmental effects such as poor drainage and negative impacts from the use of fertilizers.

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