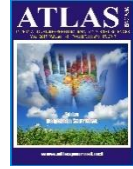




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THE EVALUATION OF THE URBAN AGRICULTURE AS URBAN ECOSYSTEM SERVICES ABOUT THE MITIGATING EFFECTS AT CLIMATE CHANGES

KENTSEL TARIMIN KENT EKOSİSTEM SERVİSİ OLARAK DEĞERLENDİRİLMESİ VE İKLİM DEĞİŞİKLİĞİNDEKİ HAFİFLETİCİ ETKİLERİ

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ABSTRACT

The urbanization and the immense increasing population in cities had a stimulating effect on the urban agriculture at recent decades with utmost importance.

The failure in urbanization and the metropolis covered with streets of bitumen evokes the pollution of air, water and soil at the terrain. In addition to that, the misuse of agricultural areas mutilates the quality of urban life. The fertile surroundings at the cities are invaded by industrial facilities and settlements cause the urban sustainability to fade. As a result of the decrement in useful agricultural lands, the food security, hygienic maintenance, the transportation of the crops and complaints about the highly disruptive pollution increase the need of a successful and efficient agricultural production in urban life.

Throughout this workshop, the urban allotment models in the global World and further researches about the benefits of the allotments to the local ecosystem and the negative aspects of climate shifts are revealed. For his instance, it is crucial to highlight the utmost importance of the sustainable urban cities for the presence of allotment gardens and further developments in urban agriculture.

Key words: urban agriculture, ecosystem services, climate change

ÖZET

Kentleşme ve giderek artan kent nüfusundaki hareketliliğin etkisi ile son yıllarda kentsel tarım kavramı önem kazanmaya başlamıştır.

Çarpık kentleşme ile beton yığını durumuna gelmiş kentlerde hava, su, gürültü, toprak kirliliği gibi çevre sorunlarının artması ve tarım arazilerinin amaç dışı kullanımı ile kent yaşam kalitesi olumsuz etkilenmektedir. Kent çeperindeki verimli tarım topraklarına sanayi ve yerleşim alanlarının kurulması ile kentsel sürdürülebilirlik gerçekleştirilememektedir. Tarım arazilerinin azalması ile sağlıklı gıda güvenliği, sağlıklı gıda temini, bu gıdaların taşımacılığı ve çevre kirliliği ile ilgili kaygılar, kent ortamında tarımsal üretimin önemini artırmaktadır.

Bu çalışmada; kentsel tarım uygulama modelleri ve bu modellerin, kent ekosistemine katkıları ve iklim değişikliğinin doğurduğu ekolojik ve çevresel olumsuz etkilerini hafifletici özellikleri ortaya konmaya çalışılarak, Sürdürülebilir kentlerde kentsel tarımın önemine dikkat çekilmek amaçlanmaktadır.

Anahtar Kelimeler: kentsel tarım, ekosistem servisleri, iklim değişikliği

1. INTRODUCTION

The vast majority of the urban population, which accounts for almost 60% of the world's population, is made up of the people who emigrate to the city since they could not get the standard of living and income that they expect from the rural settlement they live in. The process of migrating from the rural to the urban, mostly for economic reasons, also causes changes and transformations in the landscapes of the expanding metropolitan areas.

Urban systems that expand on rural landscapes that support the human life in the city cause the transformation of the landscapes that encircle the city from the structural, social and

cultural aspects while consuming the basic ecosystem services such as food, water and natural resources that the urban dwellers need.

As an extension of this multidimensional transformation, the urban agricultural activities that started with the production of food in empty places in the city to meet the nutritional needs of the families of the urban poor began to become increasingly widespread and started to be described as "urban agriculture" involving different social cultural values [1].

Urban agriculture offers alternative land use to integrate multiple functions in dense populated areas [2]. Urban agriculture practice models are the best practices that bring urban ecosystem services to the highest level [3]. As the result of the invasively growing urban areas on rural areas, natural environment is fragmented. Private gardens and urban green areas are very important in the protection of fragmented biodiversity and the sustainability of urban ecosystem services [4]. Urban agriculture has caused an increasing movement to produce food in cities in developed countries.

In such regions, urban agriculture offers a new frontier for city and region planners and landscape architects to contribute to the development and transformation of cities in order to support community gardens in cities, individualized gardens, roof gardening, edible landscapes, urban forests and other productive features of the urban environment [2].

The study evaluates the concept and models of urban agriculture in the first part while mentioning the importance and place of urban agriculture in the concept of urban ecosystem services in the second. In the third part, the role and importance of urban agriculture practices, which are considered as a part of urban green area use, in reducing the adverse effects of climatic change have been emphasized.

2. THE CONCEPT OF URBAN AGRICULTURE AND MODEL

Urban agriculture (UA) is an alternative agriculture system based on small-scale local food production in urban areas or their surrounding using organic techniques and environmental sustainability principles [5].

The term of UA expresses cultivating, processing and distributing food products that will partially meet the needs of the city by reusing the social and economic resources of the city [6].

UA is an agricultural activity carried out within the boundaries of the city. Such types of agricultural activities are widely seen in a wide range of areas when considered their variety and scale.

Range of these activities may extend from those performed by people in low income group for the production of their own food consumption to community gardens, allotment gardens, urban gardens and larger scale agricultural enterprises.

UA activities are those, which upgrade and improve ecosystem services like storm water garden, soil-building garden, habitat garden, climate mitigation farm, cultural/educational garden, and ecosystem gardens [3]. [5] added some specific use models like container garden, edible green roof, floating farm, private garden, hydroponic system, pavement garden, rooftop farm, square foot garden, windowsill farming to the mentioned UA typology.

UA activities can also be carried out in urban areas and their immediate vicinity, which are not suitable for construction due to the sloppiness and drainage problems and have been allocated to various uses for a long time, and fall into the idle state or for a while [7]. UA is increasingly becoming a form of modern agriculture in urban settings such as community gardens, fruit gardens, home gardens, vegetarian patches, public open spaces, reserves, urban

forests and recreational landscaping [8]. In the past two decades, publicly owned property, such as empty spaces in the city and its periphery, parks, gardens of public institutions, green areas around transportation arteries began to be used as agricultural lands under official permission first in African the countries then the others such as Central Asia and Latin America and today in European countries, America and China [1]. The concept of urban agriculture developed over time began to be used not only in public spaces, but also in building shells such as house gardens, roof terraces and balconies. Urban agriculture is an important means of ensuring sustainable urban development and it should not be neglected when establishing cities to create urban farming areas besides protecting agricultural land [9].

3. WHAT IS THE URBAN ECOSYSTEM SERVICES?

Ecosystem services are the benefits obtained by people from ecosystems commonly categorized into four groups: provisioning services, regulating services, cultural services, and supporting services [10].

“Provisioning services are the products people obtain from ecosystems, such as food, fuel, fiber, fresh water, and genetic resources and medicine. Regulating services are the benefits people obtain from the regulation of ecosystem processes, including air quality maintenance, climate regulation, erosion control, regulation of human diseases, and water purification. Cultural services are the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreational and spiritual activities, and aesthetic experiences. inspiration and educational values. Supporting services are those that are necessary for the production of all other ecosystem services, such as primary production, production of oxygen, and soil formation nutrient and water cycling” [10, 11, 12].

Urban green space, such as parks, forests, green roofs, streams, and community gardens, provides critical ecosystem services. Ecosystem services play an important role in struggling climate change, mitigation and adaptation strategies [13].

Ecosystem Services (ES) based planning approach is focused on understanding how services are produced and people benefit from these produced services and the efficient use of their multiple benefits while protecting ecosystems by taking into consideration the ecological processes and functions that take place in ecosystems. In this respect, the "multi-functionality" approach, which is an important implementation strategy for landscape design and spatial planning, can contribute as a rational tool for ES-based planning and management practices.

In this respect, the "multi-functionality" approach, which is an important implementation strategy for landscape design and spatial planning, can contribute as a rational tool for ES-based planning and management practices. Within the context of spatial planning, ESs are evaluated by considering the functional groups of ecosystems.

These functional groups are resource supplies (food, biological raw materials, decorative resources, genetic resources, fresh water, biochemical and medical products), regulating (air quality regulation, climate regulation, water flow control, erosion control, water treatment and waste control, epidemic disease control, pest control), supporting (food cycle, water cycle, photosynthesis, soil formation, primary production) and cultural (cultural diversity, moral and ethical values, information system, educational value, inspiration, aesthetic values, social relations), place and space sensation, cultural heritage value, recreation and ecotourism) [10].

It was stated in the studies [14, 15, 16, 17] that agriculture is dependent on natural capital of soils providing a service flow people rely on for other ES such as fresh water, regulation of nutrient cycling, flood mitigation, water purification, carbon sequestration and climate regulation and the production of or food, fiber and biomass [18]. Agricultural systems can

also be providers of ecosystem services that positively affect both human health and environmental integrity. These services are identified here as six potential benefits of urban agriculture: food production, water management, soil health, biodiversity, climate mitigation, and community development benefits [3-18]. Urban green infrastructures offer new opportunities and resources for people to manage ecosystem services [19].

4. EFFECTS OF UA ON CLIMATE CHANGE

UA practices increase biodiversity, create habitats for wildlife, outline microclimatic zones, break urban heat island effect, moderate climatic elements like humidity and temperature, increase air quality, reduce vulnerability to natural disasters, improve urban landscape, contribute positively to human wellbeing, create areas for physical exercises, provide protection from negative effects of sun and rain, reduce noise, clear dust from air, contribute to the evaluation of redundant areas and roofs, reduces size of ecological foot print, offers recreational possibilities [20-21].

Urban agriculture enables urban wastes to be converted into fertile compost and make irrigation with waste water [22]. They have a positive impact on greening city, the improvement of urban microclimate and the protection of biodiversity [23]. It also reduces the ecological footprint of the city by producing fresh food in the immediate vicinity of the city. Thus, it reduces the use of energy for transportation, packaging and cooling among others [20]. The neglected empty spaces in the city with the green areas around the residential areas have the capacity to improve the city's climate because the presence of plant vegetated areas increases the temperature in the cities, decreases the temperature, captures dust and gases in the dirty air through their leaves, provides shade and protection for places that cut wind and prevents the negative effect of solar radiation [24]. Urban green areas protect the soil, cool the air to cool down hard urban climates, reduce wind speeds and shade [23]. Ecosystem management can contribute to mitigating climate change. Agricultural management can also increase carbon sequestration using trees in soil conservation and tree forestry systems [25].

The agriculture sector also contributes significantly to GHG (Greenhouse gas) mitigation by acting as GHG sink for 10% of emissions. Agriculture creates a reduction in global GHG emissions by approximately 32% by absorbing CO₂ emissions, 42% by carbon offsets through biofuel production, 15% by reducing methane emissions and 10% from reducing emissions of N₂O [26].

5. CONCLUSION

Urban agriculture can increase the value of urban land use by preventing land use.

These areas also affect positively urban ecological systems, improving urban biodiversity, maintaining hydrological cycle, creating a micro climate environment, alleviating climatic factors, and reducing urban heat island effect. They can also contribute to the urban green network and green infrastructure.

Urban agriculture is always in interaction with the urban ecosystem as part of its integration into the economic and ecological systems of the city [27].

According to Resource Centers on Urban Agriculture and Food Security (RUAF), effect of climate change on cities increases and as the result of this process, it offered some UA strategies to reduce the effect of climate change [28]. These strategies are;

- ✓ To reduce climate change in cities, it is necessary to reduce greenhouse gas emissions and provide adequate and nutritious food for the residents.
- ✓ UA and agriculture in urban periphery and forestry should be increased as an important strategy for the adaptation to climate change and reduction of disaster risk.

- ✓ Investments in agriculture and green infrastructure have proven to be more cost-effective than other traditional approaches to climate change.
- ✓ Several cities have already promoted urban agriculture in floodplains, develop roof gardens in dense settlements, incorporate urban forestry into new housing projects, and preserve peri-urban green belts for local food production.
- ✓ To create more sustainable and flexible cities, local and national governments should better link food systems to urban planning agendas and integrate urban agriculture and climate change strategies.
- ✓ Policy participation of all actors in the food chain from producer to consumer should be improved to ensure more equitable, accountable, egalitarian and sustainable strategies.

UA plays an important role not only in food production and income generation, but also in environmental management. UA improves the reuse of organic wastes and wastewater, increases the amount of green spaces, increases the amount of oxygen and performs the functions of holding dust and particulate matter.

In addition, UA creates green zones in the management of natural disasters such as floods and earthquakes, and they are also effective in landscape management, such as keeping high ecological areas out of the construction area [20].

In cities, the effects of climate change are already evident and overall connected with urban agriculture. The “urban heat island” effect found in cities, where temperatures are always higher than the surrounding countryside [29]. When appropriately planned, UA contributes to the comfort and well-being of the residents of the city. Agricultural practices in the unused and neglected areas of the urban environment have the potential to improve the urban climate. The presence of plants and natural areas increases air humidity, moderates extreme temperatures, cleans dirty air and removes dust, prevents winds and provides shade protection for residences and especially the negative aspects of solar radiation [24].

Consequently, UA is influential as the providers of ecosystem services affecting positively both human health and environmental integrity by reducing urban waste, improving urban biodiversity and air quality, the adverse effects of ecological functions, climatic change and environmental impact of food transport and storage.

UA areas directly affect the urban climate by reducing heat island effect and surface temperature and providing shade. It raises the quality of the air by reducing the emission rate, absorbs dust and noises in the industrial and residential areas and provides the evaluation of the wastewater. The prevention of erosion in extended areas and the protection of biodiversity are also environmental influences of UA.

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