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HAZAI ÉS KÜLFÖLDI FAÜLTETÉSI GYAKORLATOK VIZSGÁLATA ÉS ÉRTÉKELÉSE SZAKIRODALMAK ALAPJÁN

EXAMINATION AND EVALUATION OF DOMESTIC AND FOREIGN TREE PLANTING PRACTICES

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ABSZTRAKT

A globális éghajlatváltozás és az urbanizáció miatt a városi faültetési programok egyre nagyobb szerepet kapnak mind hazánkban, mind nemzetközi szinten. Jelen tanulmány áttekintést ad a budapesti és nemzetközi faültetési gyakorlatokról és technológiákról, különös tekintettel a városi fásítások kihívásaira és a hosszú távú fenntarthatóság kérdéseire. A Budapesti Közművek Főkert Kertészeti Divíziónál (Főkert) végzett munkám tapasztalatai és a MATE Tájépítészeti és Tájökológiai Doktori Iskolájában végzett kutatásaim alapján elemeztük a fővárosban alkalmazott faültetési technológiákat, a fajválasztást, valamint a jogi környezetet és szabványokat is. A kutatás célja, hogy röviden feltárja a magyarországi és külföldi gyakorlatok közötti különbségeket és rávilágítson a fenntartható városi zöldinfrastruktúra fejlesztésére irányuló faültetési módszerekre. Az eredmények megmutatják, hogy a megfelelő fajválasztás és az élőhelyi környezet optimalizálása, valamint a telepítési technológiák összehangolt alkalmazása elengedhetetlen a városi faállomány fenntarthatósága szempontjából. Ugyanakkor láthatóvá válik, hogy a hazai környezetben további kutatásokra, a helyi körülményekhez igazított módszerekre van szükség a hosszú távú élhető települési környezet biztosítása érdekében.

Kulcsszavak: városi faültetés, klímaváltozás, zöldinfrastruktúra ⦿

ABSTRACT

Due to global climate change and urbanization, urban tree planting programs are becoming increasingly important both in Hungary and internationally. This study provides an overview of Budapest and international tree planting practices and techniques, with particular attention to the challenges of urban afforestation and issues of long-term sustainability. The tree planting techniques used in the capital, the selection of species, as well as the legal environment and standards were analyzed based on the experiences of my work at Budapesti Közművek Főkert Kerteszeti Divízió (FŐKERT) and my research at MATE's Doctoral School of Landscape Architecture and Landscape Ecology. The purpose of the research is to briefly explore the differences between Hungarian and foreign practices and to shed light on tree planting methods for the development of sustainable urban green infrastructure. The results show that the appropriate selection of species and the optimization of the habitat environment, as well as the coordinated application of planting techniques, are essential for the sustainability of the urban tree population. It only becomes apparent that in the domestic environment, further research and methods adapted to local conditions are needed to ensure a long-lived urban environment.

Keywords: urban tree planting, climate change, green infrastructure

INTRODUCTION

The rapid pace of climate change and urbanization presents increasing challenges for professionals responsible for maintaining the urban environment. The management of urban green spaces, especially the planting and preservation of trees, plays a central role in mitigating the effects of the heat island effect and promoting public health (Pataki 2021). In Hungary, the development of urban green areas and tree planting face difficulties due to the complexity of administrative systems, as well as social and economic factors. The highest-level legal regulation concerning green spaces and the protection of trees is Government Decree 346/2008 (XII.30) on the protection of woody plants, which serves as the implementation of the nature conservation act. However, in the urban environment, all other elements (buildings, roads, utilities, etc.) are governed by higher-level legal regulations. In 74% of major European cities, there is legislation that, in some form, serves to protect trees in public or private spaces (Schmied 2003). Compared to European practice, a comprehensive planning approach aimed at the long-term sustainability of green spaces is often lacking (Pauleit 2002). Therefore, it is necessary to develop integrated strategies that take into account the complex ecological, social, and economic components of urban tree management. The aim of this article is to present the past and present tree planting techniques in Hungary and abroad, taking into consideration key aspects such as species selection, guiding principles, and evaluating the opportunities and applicability offered by contemporary methods.

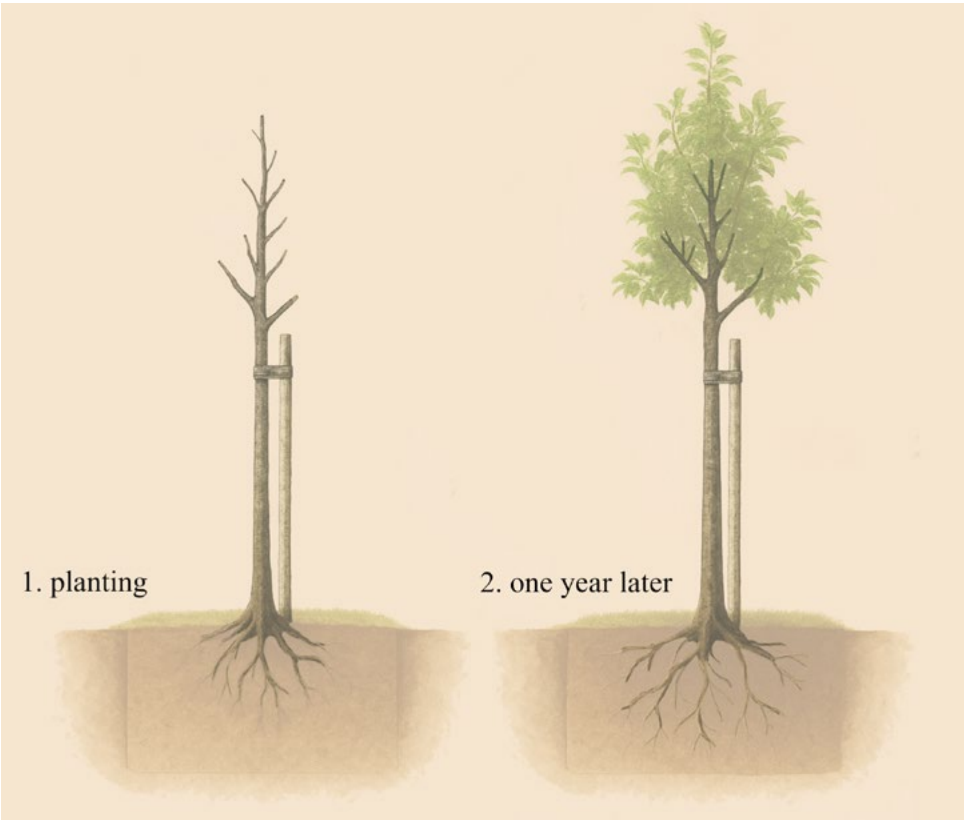
THE PAST AND PRESENT OF TREE PLANTING IN HUNGARY

The history of conscious professional efforts to develop urban green areas in Hungary has followed a fluctuating pattern, with phases of progress followed by significant setbacks. Serious attention to urban green investments began in earnest in the 1800s. In a memorandum to King Francis I, Archduke Joseph proposed the establishment of the Royal Beautification Committee, which was formed in 1805. One of the primary objectives of the committee was to develop green areas, including planting lines of trees along streets. Their work included landscaping Margaret Island, beginning the development of City Park, and planting many tree-lined avenues throughout Pest and along the Danube (Radó 1981) (Schmidt 2006).

At the beginning of the 20th century in Hungary, planting techniques included deep plowing and improved drainage, enriched with organic fertilizers and compost. The typical spacing was 10–15 meters, but 6–8 meter spacing began to appear, especially for columnar tree species. Planting pits were dug at twice the width of the root ball to allow for unrestricted root growth (Figure 1). Besides protecting trees from pests and mechanical damage, the importance of regular care and plant protection was emphasized (Cséрer 1928).

Tree planting along roads was considered a public interest undertaking, serving not only aesthetic but also public health goals such as reducing dust, providing shade, and preventing soil erosion. Great attention was paid to local climate and soil conditions and to selecting the appropriate tree species. Some of the recommended species are still in use today (Styphnolobium japonicum, Tilia spp., Celtis spp., Acer spp., Ulmus spp.), while others are no longer recommended due to invasiveness, climate

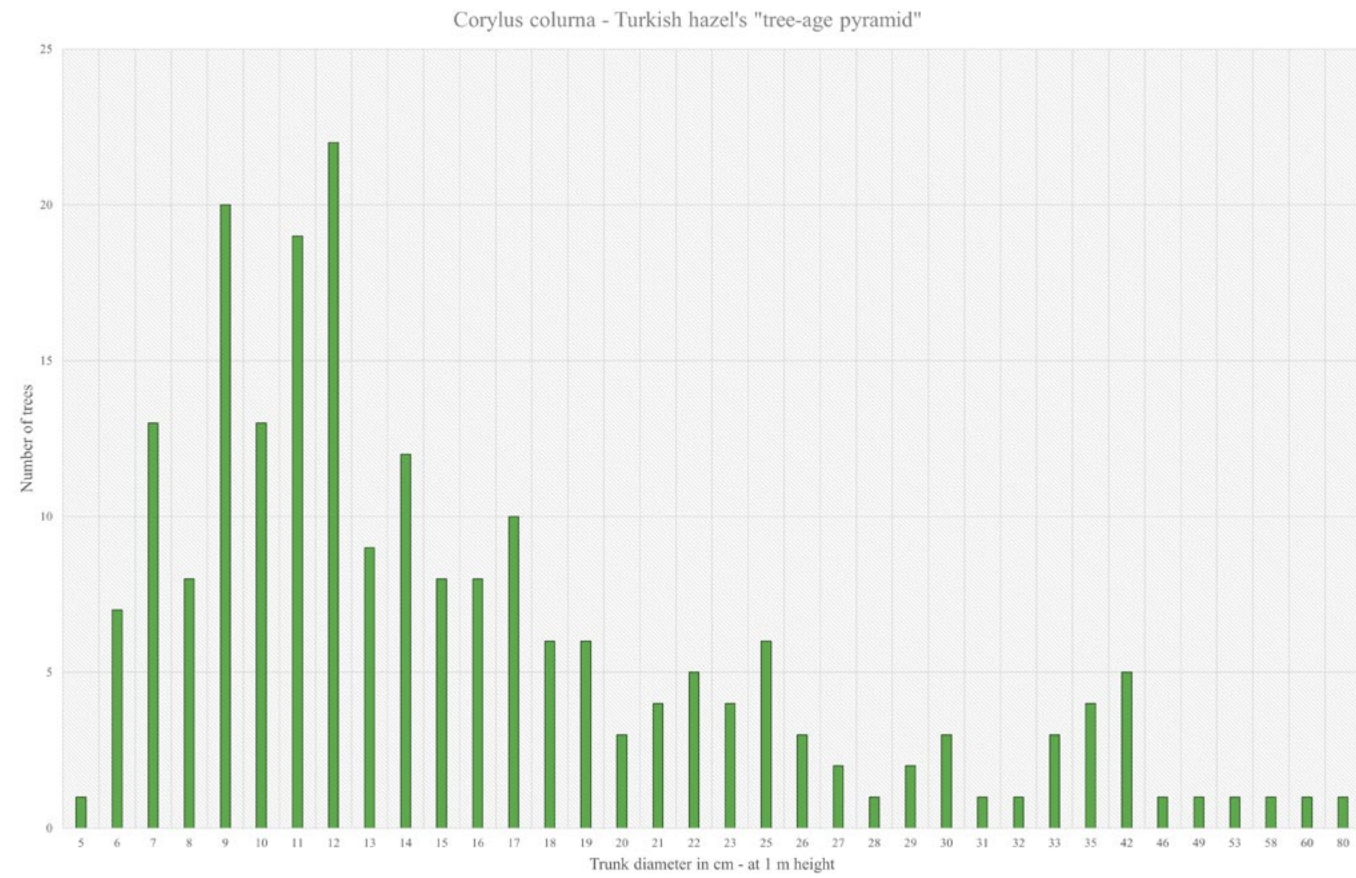
Figure 1: Schematic figure of tree planting
OWN FIGURE BASED ON CSÉRER
▸▸**Figure 2:** Tree age pyramid of Corylus colurna based on trunk diameter
BASED ON THE FŐKERT ARCHIVE



sensitivity, or other issues (e.g. Ailanthus altissima, Aesculus hippocastanum) (Kovács 2003).

The fate of Hungarian tree-lined avenues is well illustrated by the history of Andrássy Avenue, which dates back to the period following the Austro-Hungarian Compromise of 1867 (Szilágyi 2021). The planning of the avenue, which was a fundamental element of Prime Minister Gyula Andrássy's urban development program, was completed in 1876. It was divided into three sections and planted with double rows of trees. The tree-lined promenade was later affected by the construction of the continent's first underground railway, but preserving the existing trees was also emphasized. However, due to the severe damage caused by World War I, the entire route had to be replanted in 1920. By the 1960s, as road traffic increased and salt was used for de-icing, the deteriorating population of plane trees (Platanus spp.) was completely replaced around the turn of the millennium with ash (Fraxinus spp.) and hackberry trees (Celtis spp.), selected to better suit the environmental conditions. Andrássy Avenue became a UNESCO World Heritage Site in 2002, but due to excessive urban development, UNESCO issued a warning that the site could be classified as endangered. Because of its World Heritage designation, Andrássy Avenue holds a special status, as the trees lining the boulevard are considered part of its protected identity. Therefore, any restructuring of the tree line or the layout of the street faces complex challenges, and more significant landscape or urban architectural interventions cannot be applied during its renewal.

The challenges of planning rows of trees are increasing due to the dense urban fabric of our cities, the height of buildings, the presence of utility networks, and the high proportion of paved surfaces. It would be virtually impossible today to establish tree-lined streets in accordance with the planting criteria set in 1928. In fact, 70% of Budapest's rows of trees do not meet all the required criteria. The original soil structure has now largely been replaced by rubble fill and disturbed soils, so full soil replacement has become a routine procedure during the planting of tree rows. The growing size of vehicles and the increasing demand for parking spaces, combined with the presence of electrical and telecommunication cables, have further increased environmental stress and significantly restricted available planting spaces. Based on analysis of the age distribution of Budapest's tree population, the average lifespan of trees in city rows is 38–40 years — shorter than



life cycles observed in many other European cities (Radó 1999). According to the cadastral data managed by FŐKERT, Budapest's public tree stock can be analyzed species by species according to trunk diameter and quantity, allowing the construction of a sort of "age pyramid" for the city's trees. (Figure 2.) Considering their growth vigor (Schmidt 2003), age structure analyses indicate that the average lifespan of street trees in Budapest is closer to 30–35 years today. Studies also revealed that species sensitive to drought and pollution — such as maples (Acer spp.) – are less viable in urban settings, while drought-tolerant species like hackberries (Celtis spp.) show better urban stress resilience (Kaszab 2019). This highlights the need for greater attention to local environmental conditions and urban stress factors when selecting tree species, as these significantly influence the rate of tree replacement.

The most recent Hungarian professional standard for urban tree planting is defined by MSZ 12172, titled "Planting Ornamental Trees and Shrubs in Public Spaces." This document provides detailed specifications on the appropriate size of trees to be planted (trunk height and diameter), the required dimensions of the planting pit, and the anchoring techniques that may or must be used in public areas (Figure 3). Changes in environmental and spatial conditions are clearly reflected in the fact that the standard tree spacing in rows has been reduced to 6 meters, compared to much greater distances used in the early 20th century. Regarding species selection, the Catalogue of Public Space Street Trees (Hungarian Interprofessional Organization of Ornamental Gardeners 2024) offers valuable guidance. It is updated annually by experts based on practical experience. The catalogue includes both Hungarian and Latin names of species, their availability in domestic nurseries, expected height, sensitivity to lime, plant protection requirements, susceptibility to pathogens, allergenic potential, response to interventions, structural branch risks, and the likelihood of root emergence at the surface. A more recent consideration is the so-called "climate tree" classification (Szabó 2023), which responds to the challenges posed by global climate change and urban microclimate transformations.

THE PAST AND PRESENT OF TREE PLANTING ABROAD

The first technological descriptions of urban tree planting appear in foreign professional literature at the beginning

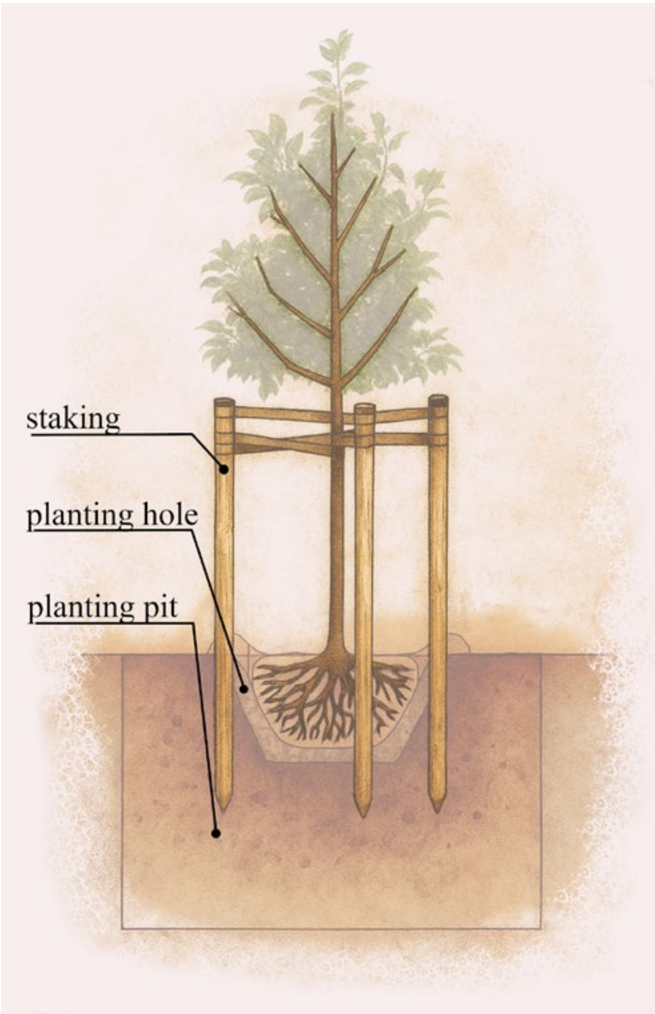


Figure 3: Tree planting
OWN FIGURE BASED ON MSZ 12172

Figure 4: Tree planting practices in European cities in the second half of the 20th century
OWN TABLE BASED ON PAULEIT

▸▸**Figure 5:** Tree planting
OWN FIGURE BASED ON EAS STANDARD

European cities	Most planted tree species	
London	Platanus sp.	Tilia sp.
Paris	Aesculus sp.	Acer sp.
Berlin	Quercus sp.	Ulmus sp.
Rome	Cupressus sp.	Olea sp.
Stockholm	Betula sp.	Acer sp.
Athens	Citrus sp.	Olea sp
Madrid	Acer sp.	Quercus sp
Barcelona	Platanus sp.	Cupressus sp.
Kopavogur	Betula sp.	Pinus sp.

of the 20th century. Fred W. Card's book Methods of Tree Planting (Card 1898) provides detailed guidance on tree planting methods, describing various soil preparation and planting techniques. Card emphasized the importance of soil preparation, which involved loosening the soil and ensuring adequate nutrient supply. Planting depth also received special attention – trees were typically planted in 60–90-cm-deep pits to ensure proper root anchorage and stable growth. The book discusses techniques applicable for establishing entire new tree rows, such as deep plowing along the entire roadside, where the soil was turned to a depth of 30–50 cm to create a loose, well-aerated rooting environment. Soil enrichment with nutrients, organic manures and green manuring was frequently undertaken. In green manuring, nutrient-rich cover crops were sown and later incorporated into the soil. The book also highlights the importance of selecting suitable tree species, taking into account local climatic and soil conditions. After planting, thorough watering of the soil was essential to ensure adequate moisture levels for the roots. In caring for young trees, special emphasis was placed on mulching, which helped maintain soil moisture and suppress weed growth.

By the turn of the millennium, the primary objectives of tree planting in European cities had clearly become the improvement of urban environmental and air quality, as well as the enhancement of aesthetic value. These practices increasingly focused on adaptation to local environmental conditions and emphasized sustainability. Common planting techniques included deep plowing and mulching, which helped retain soil moisture and suppress weed growth. Nutrient supplementation, regular watering, and pruning were also routinely used to support the healthy development of trees (Pauleit 2002). In terms of species selection, it became common not only to plant varieties already adapted to local climates but also to experiment with new species chosen for their urban tolerance or other desirable traits. Further considerations included improving air quality, increasing aesthetic value, mitigating the urban heat island effect, expanding green areas in general, enhancing sustainability and biodiversity, and supporting the local ecosystem (Figure 4).

A global trend toward urban greening is now clearly observable: city leaders around the world are planting trees to increase green space and mitigate the negative effects of climate change and urbanization. However,

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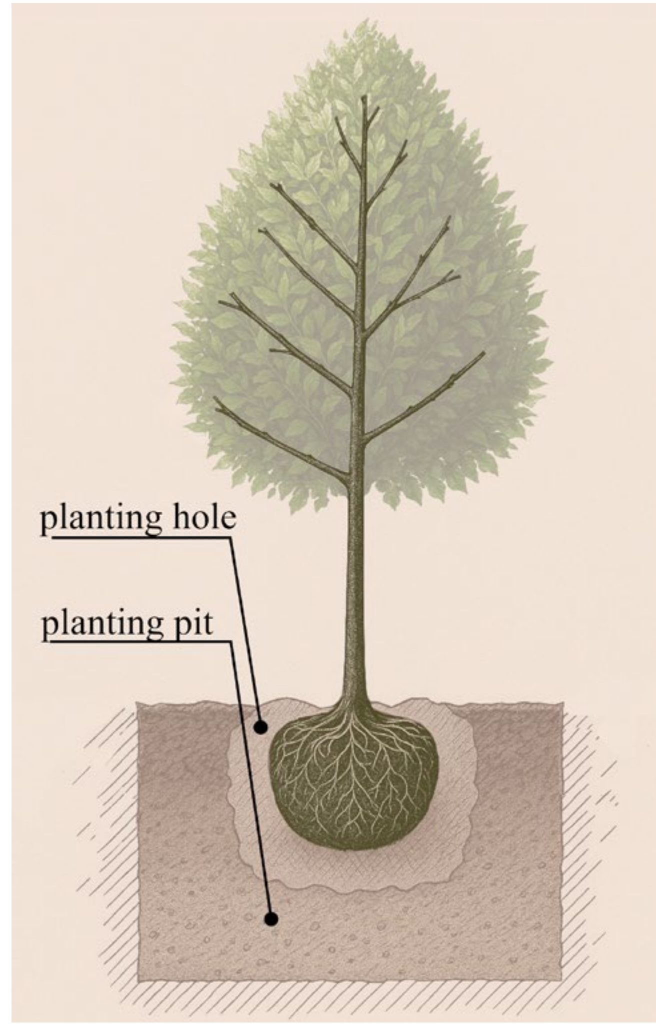

until recently, no comprehensive surveys had been conducted on the number and species composition of planted trees. Since ecosystem-level impacts often extend beyond the jurisdiction of individual municipalities, it is important to analyze tree planting patterns more broadly. One study examined recent tree planting data from 52 cities in the northeastern United States; four major cities – New York, Boston, Philadelphia, and Washington D.C. – accounted for 87% of all plantings. Smaller cities planted proportionally fewer trees, and 40% of them included invasive species, which indicates either a lack of expertise or limited resources (Doroski 2020). It is therefore crucial to identify species that are more resilient to the intensifying impacts of climate change and can better tolerate resulting environmental challenges such as air pollution, soil compaction, de-icing salts, extreme temperatures, and drought.

Internationally, the field of urban forestry is more widely recognized in the context of municipal tree planting. Urban forestry specifically addresses the challenges of this unique environment. Urban forests often suffer from low species diversity – partly due to overreliance on tree species known to tolerate urban conditions, and partly because cities typically plant vegetatively propagated cultivars with limited genetic variation, which reduces both diversity and resilience (Csérer 1928). It is therefore important to prioritize tree species that possess broader resistance to multiple stressors, and to maintain the diversity of urban forests in order to enhance long-term sustainability. Ongoing research and adaptive management are necessary, especially in response to environmental conditions that are changing alongside the climate. Among species, Ginkgo biloba shows the highest tolerance to air pollution; Gleditsia triacanthos exhibits resistance to soil compaction and salt exposure; and Quercus spp. (oak taxa) are particularly resilient to wind and snow. In contrast, Acer spp. (maples), Betula spp. (birches), and Pinus strobus (eastern white pine) are among the most intolerant species, often sensitive to the full range of urban stressors (Carol-Aristizabal 2023).

The professional expectations and recommendations for municipal tree planting techniques are summarized and presented by several international professional organizations. The European Arboricultural Standards (EAS) aim to develop continent-wide technical standards for pruning, planting, and structural support of trees (EAS 2022). These comprehensive collections of professional guidelines cover a broad range of topics and reflect best practices across Europe. They also provide technical definitions and clear guidance (Figure 5). The unified international standard of the profession is further demonstrated by the many professional manuals available on the website of the International Society of Arboriculture (ISA 2024), which outline consistent principles and expectations for site preparation, tree maintenance, monitoring, and protection.

TECHNICAL AND TECHNOLOGICAL OPPORTUNITIES

When planning tree planting in urban environments, it is essential to begin with three main considerations: where, what, and how to plant. For the field of urban forestry, these are fundamental questions – yet the name and concept of the profession still sound unfamiliar in the Hungarian professional context. This vocation, positioned at the intersection of landscape and urban planning, horticulture, and forestry, was born from the need to improve urban living conditions by integrating knowledge from these disciplines. The unique built environment into which we confine trees – living elements that change in

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Figure 6: Tree species proposed for investigation
OWN TABLE BASED ON THE FŐKERT ARCHIVE

Species name	Height (m)	Crown diam. (m)	Crown type	Habitat	Soil requirement
Acer buergerianum	10-15	6-8	Rounded	Slightly humid, sunny	Semi-Dry
Acer campestre 'Zenta'	8-15	6-8	Conical crown	Light-demanding	Any
Acer campestre 'Korinthosz'	8-15	2-4	Columnar	Partial shade	Any
Acer campestre 'Lienco'	6-10	3-5	Columnar	Sunny, partial shade	Any
Acer henryi	6-10	6-8	Globular, semi-open	Shade-tolerant	Semi-Dry
Acer platanoides 'Emerald Queen'	15-20	8-15	Upright-growing	Partial shade	Semi-Dry
Acer platanoides 'Fairview'	10-15	8-15	Oval, dense	Broad ecological tolerance	Semi-Dry
Acer triflorum	10-15	6-8	Oval, semi-open	Partial to full shade	Semi-Dry
Carpinus betulus 'Fastigiata'	15-20	5-6	Slender, conical	Shade-tolerant	Any
Carpinus caroliniana	10-12	6-9	Broad-spreading, flattened	Sunny, partial shade	Any
Catalpa speciosa	15-20	10-15	Pyramidal	Broad ecological tolerance	Any
Celtis 'Magnifica'	10-15	10-12	U-shaped	Partial to full shade	Any
Fraxinus pennsylvanica 'Patmore'	15-20	10-12	Fork shaped	Drought-tolerant	Any
Ginkgo biloba 'Lakeview'	10-15	6-8	Columnar	Broad ecological tolerance	Any
Ginkgo biloba 'Fastigiata'	15-20	4-8	Columnar	Light-demanding	Any
Koelreuteria integrifolia	9-12	9-12	Loose, irregularly round	Drought-tolerant, sun-loving	Dry
Liquidambar syraciflua 'Gumball'	4-5	3-4	Round or flat-topped	Sun-loving	Acidic, neutral
Liriodendron tulipifera	20-30	15-20	Tall-conical, broad-spreading	Med. water supply	Nutrient-rich
Liriodendron tulipifera 'Fastigiatum'	15-20	3-5	Columnar	Med. water supply	Nutrient-rich
Ostrya carpinifolia	10-15	8-10	Spherical	Sunny, partial shade	Med. dry
Prunus × eminens 'Umbraculifera'	3-5	3-4	Spherical	Med. drought-tolerant	Normal, well-drained
Pyrus pyraster 'Bihar'	8-10	4-8	Spherical crown	Warmth- and sun-loving	Nutrient-rich
Robinia pseudoacacia 'Unifoliola'	10-15	8-10	Wide pyramidal	Broad ecological tolerance	Dry
Sorbus alnifolia	10-12	4-8	Regular oval, rounded	Sunny, partial shade	Any
Tetradium daniellii	10-20	8-12	Semi-open	Avoids extreme conditions	Loose, warm
Tilia cordata 'Greenspire'	15-20	10-12	Broad conical	Partial shade	Nutrient-rich
Tilia tomentosa 'Bori'	10-15	8-10	Sherical, egg-shaped	Sun-loving, med. drought-tolerant	Fresh, nutrient-rich
Tilia tomentosa 'Zentai Ezüst'	15-20	10-15	Regular conical	Sun-loving, med. drought-tolerant	Fresh, nutrient-rich
Ulmus 'Columella'	15-20	3-6	Loose, irregularly round	Warmth- and sun-loving	Moist
Ulmus 'Lobel'	15-18	4-6	Slim conical	Dry conditions	Dry
Zelkova carpinifolia	25-30	10-15	med.-sized	Warmth- and sun-loving	Fresh
Zelkova serrata 'Green Vase'	15-20	8-12	Vase-shaped	Warmth- and sun-loving	Fresh
Zelkova serrata 'Fastigiata'	10-12	4-5	Columnar	Warmth- and sun-loving	Fresh

Species name	City tolerance	Traits	Authors' Notes
Acer buergerianum	Moderate	Sensitive to tree care interventions	Good foliage retention, resistant
Acer campestre 'Zenta'	Good	Street rows	Susceptible to powdery mildew and aphids
Acer campestre 'Korinthosz'	Good		Susceptible to powdery mildew and aphids
Acer campestre 'Lienco'	Good		Susceptible to powdery mildew and aphids
Acer henryi	Good	Pathogen free	Rare species, not much experience in urban use
Acer platanoides 'Emerald Queen'	Moderate	Fast growing, flood resistant	Leaf drying occurs in the summer months
Acer platanoides 'Fairview'	Moderate	Resistant to flooding	Leaf drying occurs in the summer months
Acer triflorum	Good	Pathogen free	Rare species, not much experience in urban use
Carpinus betulus 'Fastigiata'	Good	Fast growing	Susceptible to powdery mildew
Carpinus caroliniana		No serious pathogens	Rare species, not much experience in urban use
Catalpa speciosa	Good	No serious pathogens	Rare species, not much experience in urban use, Susceptible to powdery mildew
Celtis 'Magnifica'	Good	Non-invasive	Hybrid (C. occidentalis × C. laevigata)
Fraxinus pennsylvanica 'Patmore'	Good		Non-invasive, male variety, keeps healthy foliage, but it does not last very long
Ginkgo biloba 'Lakeview'	Good		Grows slowly
Ginkgo biloba 'Fastigiata'	Excellent		Grows slowly
Koelreuteria integrifolia	Good		Rare species, not much experience in urban use
Liquidambar syraciflua 'Gumball'	Good	Cannot withstand prolonged drought	
Liriodendron tulipifera	Moderate	Sensitive to salinity, soil drought	Healthy foliage
Liriodendron tulipifera 'Fastigiatum'	Moderate		Healthy foliage
Ostrya carpinifolia	Good	Slow growth, sensitive to nursery intervention	Good foliage species
Prunus × eminens 'Umbraculifera'	Weak	Susceptible to mildew and moniliasis	Short-lived tree with a regular crown
Pyrus pyraster 'Bihar'	Good	Susceptible to tree care interventions, powdery mildew	It tolerates dry conditions, but is not a commonly used
Robinia pseudoacacia 'Unifoliola'	Excellent		Rarely used in cities, thornless
Sorbus alnifolia	Good	Varieties: 'Red Bird', 'Skyline'	Rarely used in cities, grows slowly
Tetradium daniellii	Good		Invasive species
Tilia cordata 'Greenspire'	Good	Good adaptability	Leaf margin drying occurs
Tilia tomentosa 'Bori'	Moderate	Fast growing	Leaf margin drying occurs
Tilia tomentosa 'Zentai Ezüst'	Moderate	Good adaptability	Leaf margin drying occurs
Ulmus 'Columella'	Moderate	Resistant to Elm tree damage	Rarely used in cities, grows slowly
Ulmus 'Lobel'	Moderate	Moderately resistant to Elm tree damage	Fast growing, wind tolerant
Zelkova carpinifolia	Good	Botanical rarity, ext. weather tolerance	Rare species, not much experience in urban use
Zelkova serrata 'Green Vase'	Good	Ext. weather tolerance	It does not like dry conditions.
Zelkova serrata 'Fastigiata'	Excellent	Ext. weather tolerance	It does not like dry conditions.

size, needs, and condition over time — is fundamentally unsuitable for their safe and cost-effective maintenance, let alone for the optimal exploitation of their beneficial effects (Konijnendijk 2004). One of the key challenges of our time is to find a balance between the inert and living, built and planted, static and dynamic elements of urban spaces. Urban forestry is an integrated concept that combines the science and technology of managing trees and natural resources within the urban ecosystem to provide psychological, sociological, aesthetic, economic, and environmental benefits to society.

Urban tree planting and the development of green infrastructure in cities have become essential for mitigating the effects of climate change and improving urban quality of life. As is the case worldwide, Hungarian tree planting practices are increasingly adapting to environmental challenges. Reevaluating the current legal framework and urban planning priorities could create opportunities for the sustainable expansion of green spaces. The maintenance and protection of urban trees can be most effectively achieved within shared, integrated regulatory frameworks — treated as an infrastructural priority equal to other public services.

To enhance species diversity and adaptation to the urban environment, it is especially important to select resilient tree species suited to Budapest's ecological conditions. This would allow tree rows to achieve greater longevity and improved resistance to environmental stressors induced by climate change. Innovative soil management solutions — such as root cell planting systems (GreenBlue Urban 2024) or the Stockholm method — can promote healthier root development even in heavily compacted urban soils (Embrén 2009). The application of such techniques can improve the long-term success of tree planting, particularly in dense urban environments where soil quality presents a major limitation. However, it must be acknowledged that these are not "silver bullet" solutions; they make the urban environment more tolerable for trees by adapting to challenging conditions, rather than creating truly ideal growing habitats.

New techniques must always be adapted to the specific local environment — sometimes by combining methods or by developing new solutions based on practical experience. In recent years, an increasing number of tree planting projects in Budapest have been implemented using custom soil substrates (e.g. the renovation of the Dreschler Palace on Andrássy Avenue, tree planting along Széchenyi Quay, and the creation of "root wellness" zones on Bartók Béla Street), all of which provide opportunities to evaluate their effectiveness. A prominent example of this type of green infrastructure development is the renovation of Blaha Lujza Square in Budapest's 8th district. There, beneath a paved surface, trees were planted in a shared, continuous 2,400 m² soil bed, equipped with an irrigation system and built using a combination of root cell and Stockholm methods, filled with a custom structural soil mix and sealed with a clay-based impermeable layer (Lépték-Terv 2024). Several mature trees already present at the site were preserved alongside the newly planted specimens. To strengthen the tree population and foster natural root relationships, a preparation containing mycorrhizal fungi was introduced into the soil.

Considering as many factors as possible in the analysis of municipal tree planting supports more conscious and effective planning. Research on the climate tolerance of tree species and cultivars (Szabó 2023), the deliberate application and testing of habitat improvement techniques (Budapest Capital Municipality 2021), and the evaluation of planning and maintenance practices for more efficient spatial use (Tóth 2024) all represent distinct components in the advancement of urban forestry in Hungary. Due to the intensification of environmental stressors, the relatively short average lifespan of street trees creates an opportunity to continuously test new species and cultivars under known environmental conditions during the implementation of new planting projects (Figure 6).

CONCLUSION

Based on the reviewed literature, it is evident that the need and mindset for horticultural maintenance, conscious provision, and even the development of plant stocks in our major cities have long been present. At the same time, it is also observable that the attention devoted to green space development tends to fluctuate between two extremes: representational ambitions and post-disaster restoration, with generally limited emphasis in between. As early as the beginning of the 20th century, the theoretical foundations of the profession set expectations that corresponded to the challenges of the time in terms of practical implementation. Both in Hungary and abroad, long-term planning and preparation were regarded as fundamental considerations. However, it is important to recognize that the surviving manuals used as sources tended to describe ideal, professionally expected techniques rather than providing a comprehensive picture of actual practice — much as we still experience today. The findings highlight that although Hungarian urban tree planting practices are in some respects competitive with international examples, there remains significant potential for improvement in terms of sustainability and environmentally conscious solutions.

In summary, the development of tree planting practices in Budapest requires both technological innovation and strengthened regulation adapted to local conditions. Domestic and international experience indicates that the long-term success of urban tree planting depends on an integrated, sustainability-oriented approach that considers both environmental and community needs. This article was written as part of my PhD research, which investigates the effectiveness of municipal tree planting practices in Hungary. By analyzing Budapest's tree population — taking into account health status, growth indicators, and urban placement — we can expect to gain better insight into the applicability of both established and innovative planting techniques under local conditions. This, in turn, will enable us to respond more effectively to the impacts of urban climate change in the planning and operation of green spaces. ◉

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