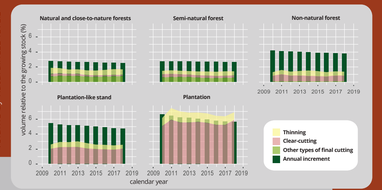
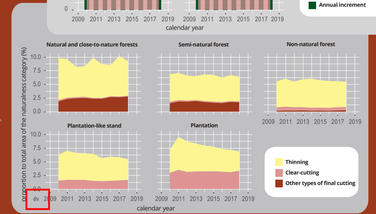
Annual increment and harvested volume

Annual increment and felling volume by naturalness levels



Harvested area by naturalness levels

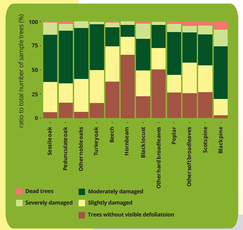


The concept of sustainable forest management was developed as a reply to the excessive wood removal: *'forests are wasted'* – states the Forest Regulation. In a sustainable system, harvest must be lower than the increment.

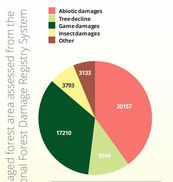
Except for plantations (i.e., the less natural forests), annual increment is much higher than felling volume in the Hungarian forests. Clear-cutting is very rare in more natural (i.e., close-to-nature and near-nature) forests. In contrast, removed volume is approximately equal to increment in the intensively managed plantations where clear-cutting is commonly applied. The annual harvested area is about 7-10 % of total forest area and area of final cuts is 1-3 % of that.

Health condition

Health condition by species in sample plots of Forest Protection Network

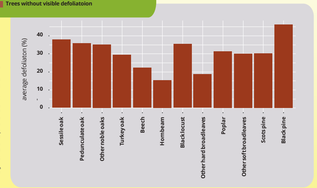


Damaged forest area assessed from the National Forest Damage Registry System



Figures show the area of the given damage type in hectares.

Defoliation by tree species in 2018

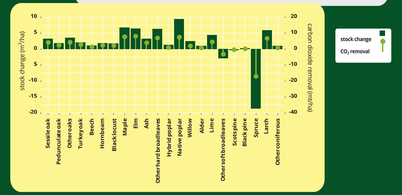


Monitoring forest damages as well as preventive and protective actions are of great importance in sustainable forest management. Forest Regulation already established a suitable personnel in order to prevent and extinguish wildfires. Today, belonging to the Forest Protection Measurement and Monitoring System, the Forest Protection Network and the National Forest Damage Registry System are serving this purpose.

Carbon dioxide removal

Stock change and carbon dioxide removal

Stock change and carbon dioxide removal per hectare

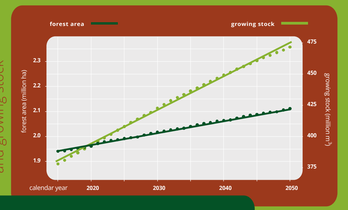


Climate change and mitigation have become new aspects of sustainability in today's forest management. Hungarian forests remove approximately 8 % of total domestic carbon dioxide emission.

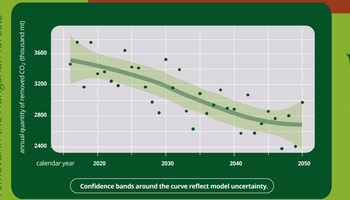
Carbon dioxide removal capacity of various tree species is determined by growth dynamics together with their wood density. Fast-growing and lightweight poplar species store much less carbon than the dense oaks. The decline of spruce results in carbon dioxide emission, because growing stock reduction means some form of release of carbon stored in the wood.

Yield regulation and forecasting

Projected forest area and growing stock



Modelled future carbon dioxide removal in the Hungarian forests



Since Maria Theresa, one main task of sustainable forest management has been to respect needs of future generations in advance. This requires statistical modelling and forecasting of forest area and growing stock.

Regarding the present age distribution of forests and assuming that no changes will occure in forest management practice, forest area and growing stock will increase in the medium term (i.e., up to 2050). However, due to aging, annual increment and consequently carbon dioxide removal will slightly decrease.

FOREST RESOURCES AND MANAGEMENT IN HUNGARY 2018

This leaflet is based on data of the National Forestry Database and Forest Monitoring and Observation System

NÉBIH ERDŐGAZDÁLKODÁSI KÖZPONT

250 years of sustainable forest management: Forest Regulation 1769-2019

In Hungary, the regulation of forest management has a long history. The first official disposal (hereinafter called Forest Regulation) was legislated by the Hungarian Queen Maria Theresa 250 years ago (*'Regulation of tendance and maintenance of trees and forests'*). The main aim of this act was to preserve forests for future generations (*'the objective of this regulation of tree and forest cutting is to maintain them in good condition at all times*). This means that forest management must not endanger wood supply even in the long term. This principle – referring only to wood supply at this time – is called sustainability.

In order to ensure sustainability of forest management, Forest Regulation controls spatial and temporal pattern of harvesting, prescribes cutting ages, makes regeneration mandatory, propagates afforestation, contains provisions for forest protection and establishes simple forest inspection institutions.

During the past century, the focus of attention shifted to immaterial (non-wood) goods of forests, such as wildlife and biodiversity conservation as well as social services. These new demands incorporated gradually into the sustainability concept. Thus, sustainability was redefined and became more holistic including all components and services of forest ecosystems.

This leaflet summarizes some fundamental elements of sustainable forest management which can be derived from the first forest act, the Forest Regulation and which form the basis of present-day forestry practice.

Characteristic statistics on the Hungarian forests

CATEGORY	UNIT	STATISTICS
Total area under forest management	thousand ha	2055.2
of which in ownership	thousand ha	1154.6
in communal ownership*	thousand ha	21.0
in private ownership	thousand ha	843.8
in mixed ownership	thousand ha	35.9
Area of forest stands	thousand ha	1939.2
Other area under forest management**	thousand ha	116.1
Forest ratio	percent	20.8
Growing stock	million gr. m^3	389.7
Annual increment	million gr. m^3	13.0
Total felling volume	million gr. m^3	7.8
Final cut volume	million gr. m^3	5.4
Initial afforestations	thousand ha	1.3
Initial regenerations	thousand ha	14.2
Regenaration obligation after final cut	thousand ha	22.0
Completed regenerations	thousand ha	26.1

* Communal forests involve municipal forests and forests of various NGOs (churches, foundations etc.).
** Other area comprises non-forested areas serving forest management purposes (such as roads, cleanings etc.).

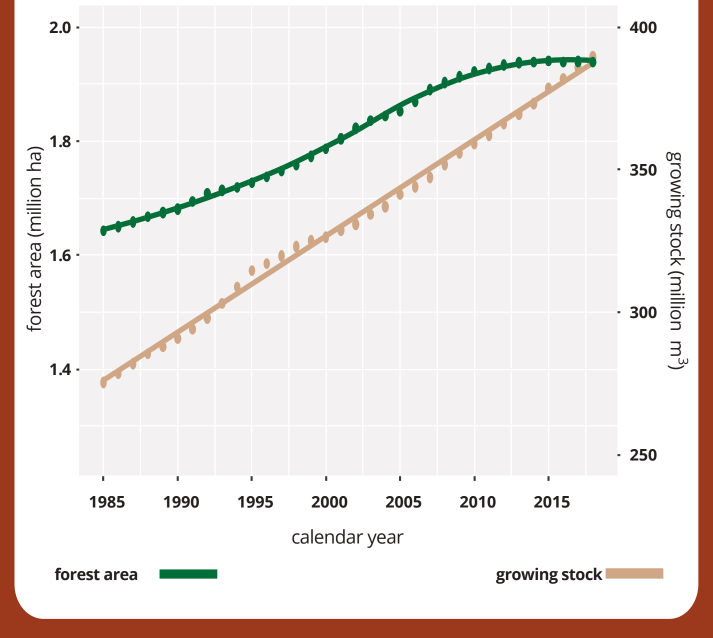
Forest area and growing stock

The dashed vertical lines show the medians (3.3 hectares and 1.7 hectares in public and private sector, respectively)

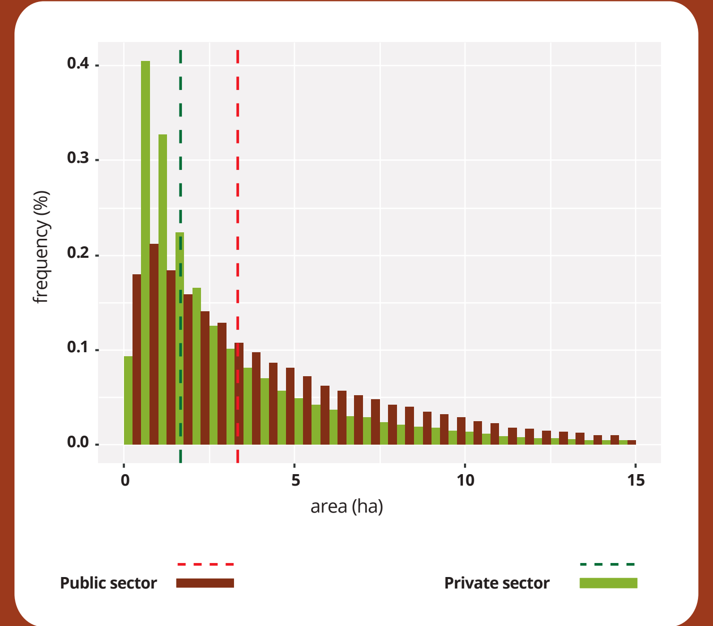
Annual change of forest area and growing stock is a good indicator of sustainable forest management. Afforestation was facilitated already in the Forest Regulation: *'Considering the fact that forest area has been decreasing whereas demand on wood has been increasing year-by-year, our strict commandment is that house owners must plant every year at least 20 trees nearby the house, court, garden, grange and meadows where it is possible. On wet soils birch, willow and alder trees, on dry clayey soils elm trees should be planted.'*

The spatial unit of forest management is the so-called forest subcompartment. Within a subcompartment site conditions and species composition of the tree stand are more or less homogeneous. Mean area of forest subcompartments is around 4 hectares. However, the distribution is right-skewed, which means that smaller subcompartments are more frequent, particularly in the private sector.

Forest area and growing stock

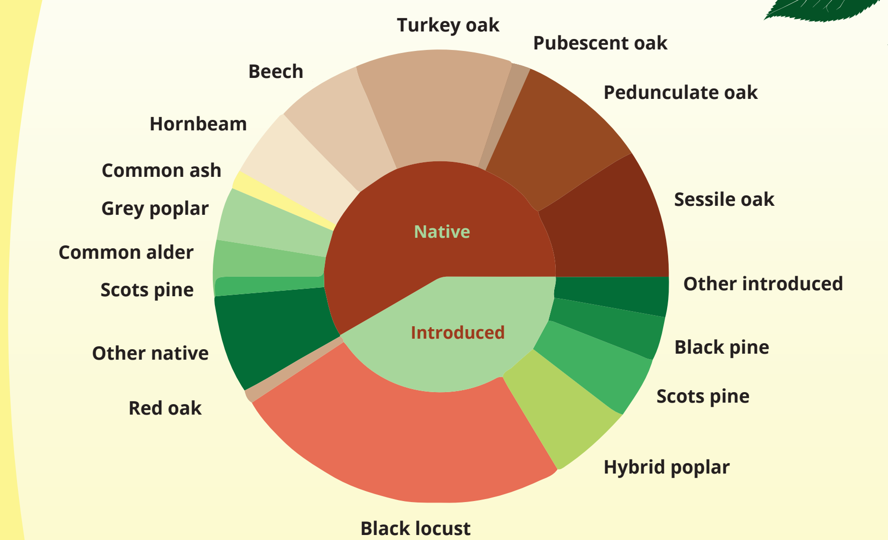


Area distribution of forest subcompartments



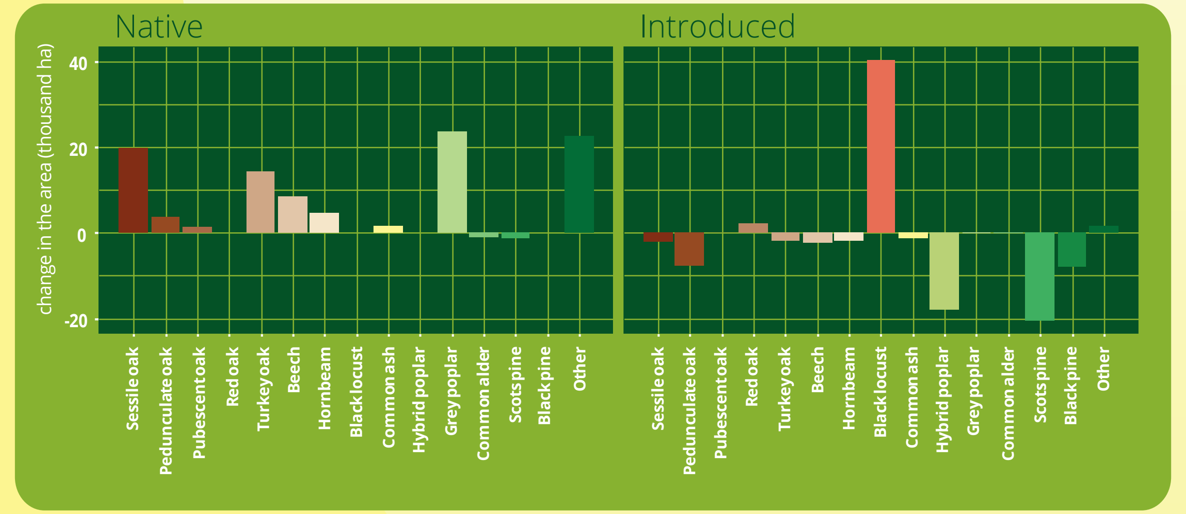
Species distribution

Native means that the given species occurs naturally within the given forestry region (thus, nativeness is defined on a sub-country regional level). Inside slices of the nested pie chart show whether a species native or not. Outside slices reflect the area occupied by the species. Scots pine can be classified either native or introduced because it is not native to all forestry regions.



Area distribution of native and introduced species

Changes in the area of tree species between 2005 and 2018

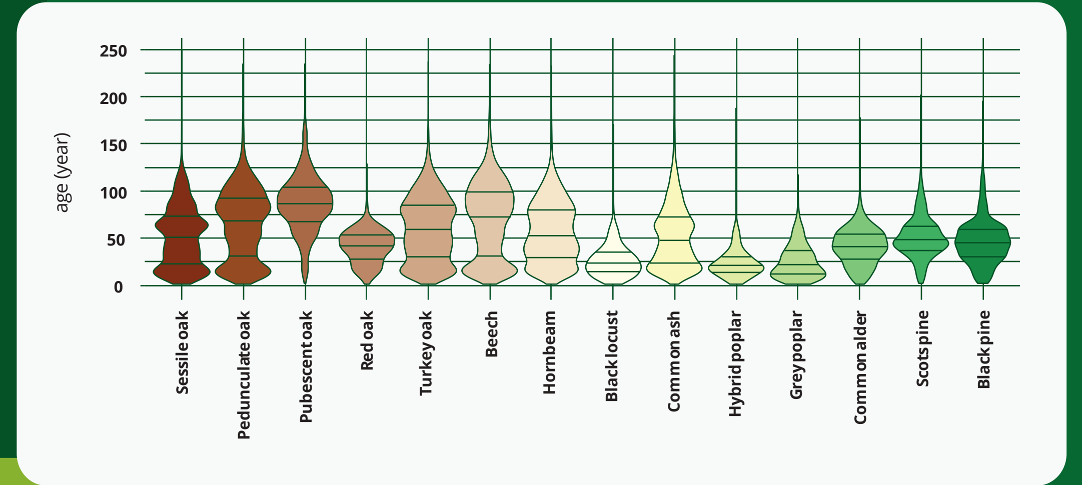


Today, sustainable forest management addresses a multifunctional view of forests and optimizing their benefits, in which ecological aspects must be taken into consideration as well. Management must not endanger the naturalness of forests which is indicated by the species composition appropriate for site conditions.

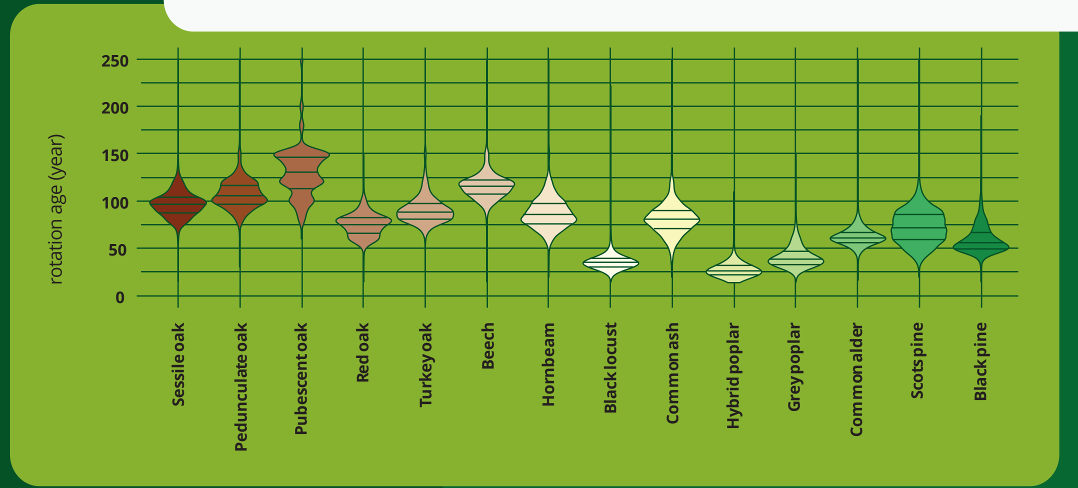
The majority of the Hungarian forests consists of native species. Stands of introduced species were planted on previously non-forested areas. In the last 10 years, the area of some introduced species (like hybrid poplars and pines) has been decreasing whereas native species have been spreading.

Current age and rotation age

Age distributions of tree species



Distributions of rotation age by species



Area of each violin chart is equal to 1 (i.e. 100 %). Horizontal lines show the medians, the upper and the lower quartiles.

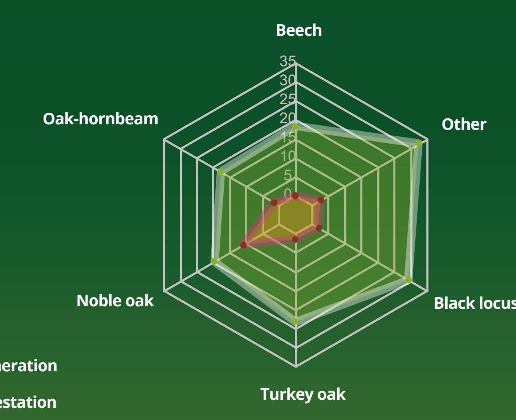
Future wood supply depends on age and cutting age distributions. Sustainibility requires that the planned cutting age should be adjusted to the growth dynamics of the tree species, as the Forest Reguation stated: *'It should be taken into consideration how much time is needed for a tree to grow up'*. Final cutting ages must be carefully planned because wood supply should be continuous. Thus, the Forest Regulation prescribes that harvests should be carried out following a predefined schedule, ensuring in this way that each stand can reach mature stage.

The wide spread age distribution of the Hungarian forests indicates that volume of wood available for harvesting will be sufficient for the next decades.

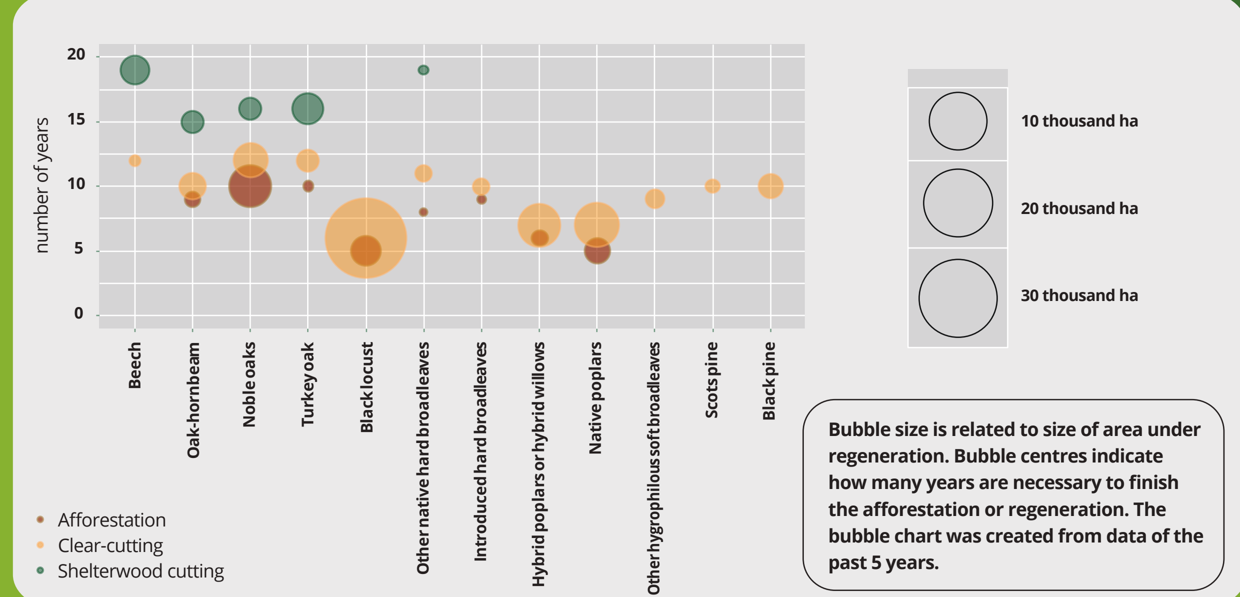
Afforestations and reforestations

Radar chart shows data in polar coordinate system. Contrary to the Cartesian coordinate system, poligon shapes are meaningful because they are related to variable values. Thus, visual comparison becomes more impressive.

Area of ongoing forestations by stand types (thousand ha)



Length of regeneration and afforestation process


number of years
Beech
Oak-hornbeam
Noble oaks
Turkey oak
Black locust
Other native hard broadleaves
Introduced hard broadleaves
Hybrid poplars or hybrid willows
Native poplars
Other hygrophilous soft broadleaves
Scots pine
Black pine
10 thousand ha
20 thousand ha
30 thousand ha
Afforestation
Clear-cutting
Shelterwood cutting

Bubble size is related to size of area under regeneration. Bubble centres indicate how many years are necessary to finish the afforestation or regeneration. The bubble chart was created from data of the past 5 years.

Regeneration and afforestation have been fundamental in sustainable forest management since the Forest Regulation of Queen Maria Theresa: *'Since spontaneous regeneration after cutting old trees scarcely occures, young trees must be planted manually. New forests must be established in those sites which are suitable neither for cropland nor for vineyards if wood is demanded there.'*

Nowadays, ongoing forest regeneration occupies ten thousands of hectares. We can found recently planted afforestations on thousands of hectares. Afforestations and regenerations can be regarded successful only if the species composition, the closure and the height of the young stands areappropriate, and their development into a mature stands is guaranteed. Regeneration of slow-growing species may last some decades.

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Full text of the Forest Regulation is available at the OEE Wagner Károly Digital Library: http://eprints.edk.oee.hu/78/
Cover image: Erika Csilla Molnár