Faculty of Forestry and Wood Technology

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Forest establishment and regeneration

Mendel University in Brno

The subject of this presentation

1. Terminology in regeneration and global situation
2. Natural and artificial regeneration
3. Species selection and creation of forest mixture
4. Soil preparation

Forest establishment or regeneration

Establishment – discontinuity

Regeneration - continuity

Theoretical background of regeneration

deforestation

reforestation

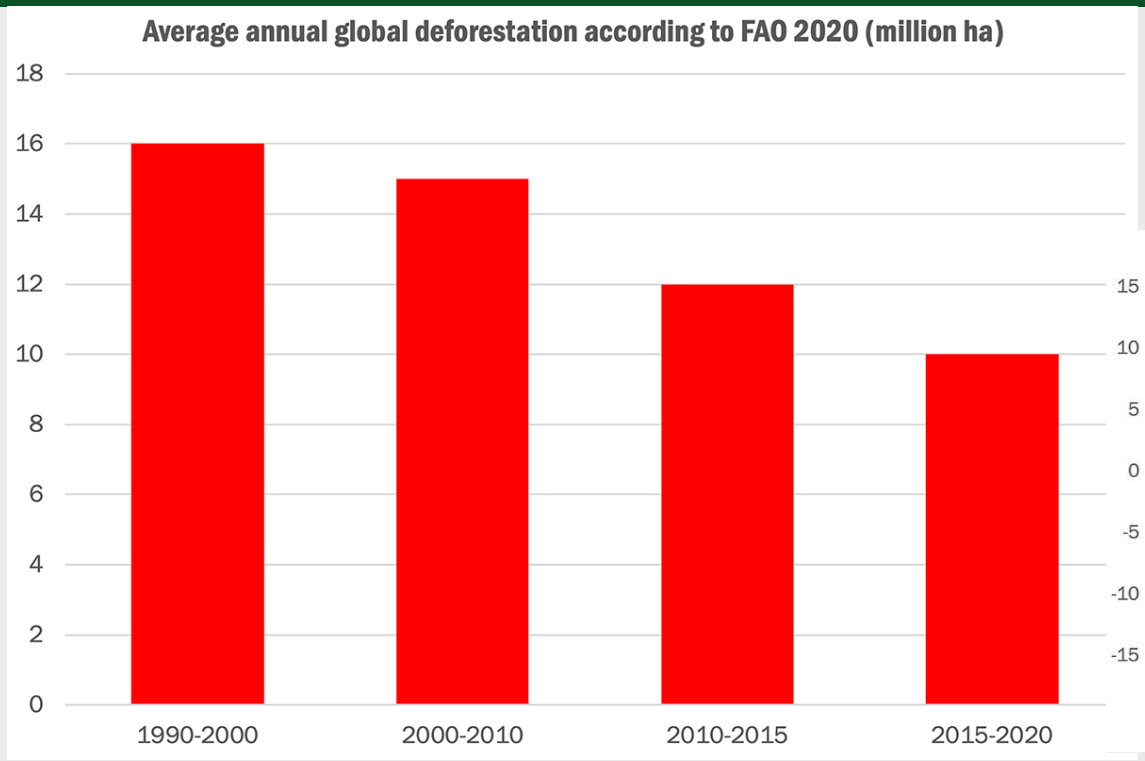
afforestation

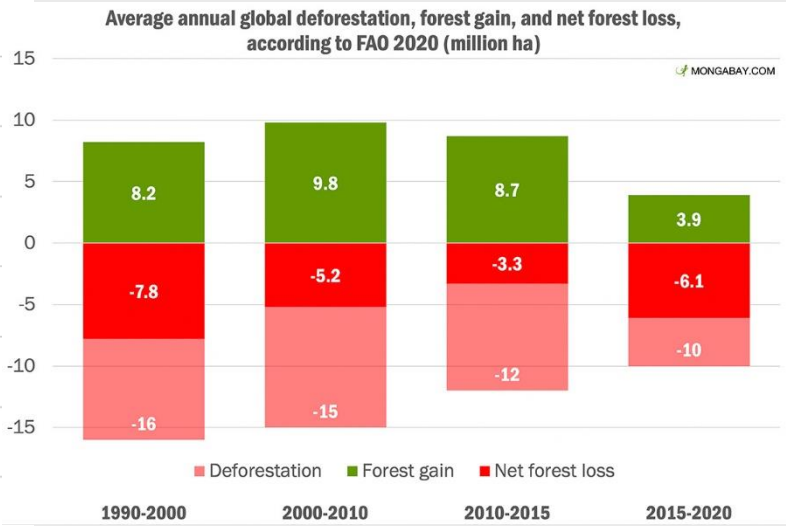
natural forest expansion/ forest reversion

deforestation – impact on human population

Illegal deforestation for palm oil

deforestation - extend

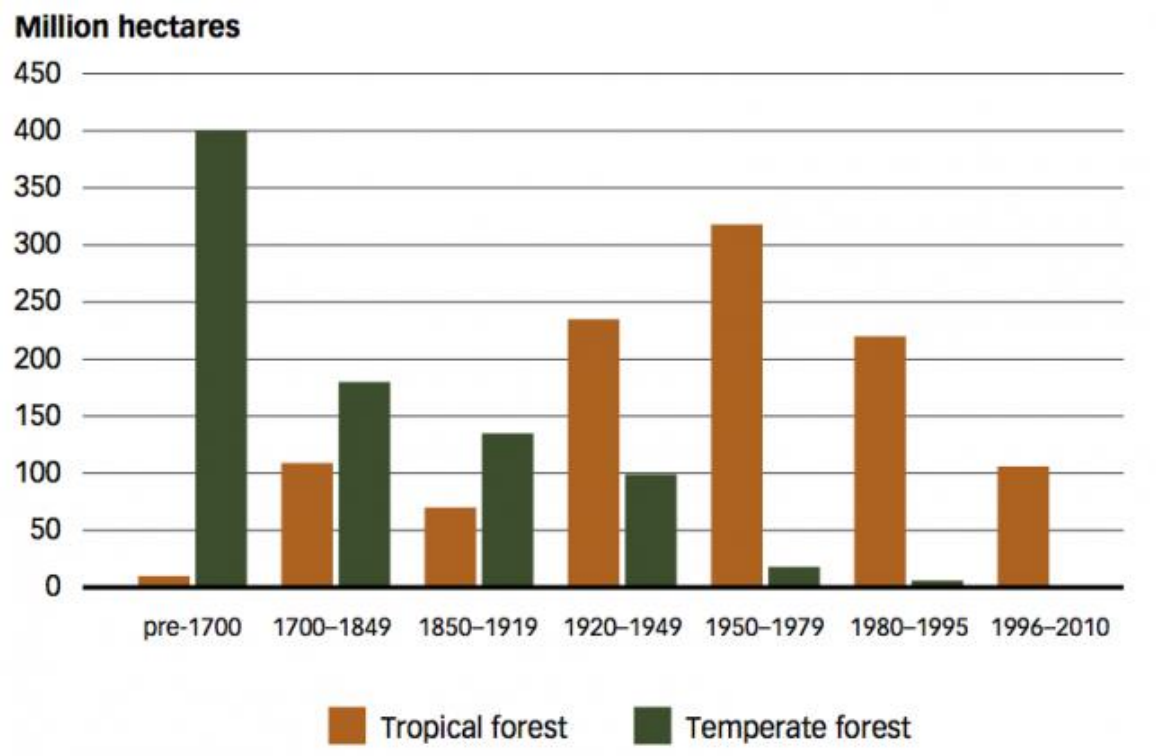




Oil palm estate and rainforest in Malaysian Borneo

deforestation - reasons

https://ourworldindata.org/forests



Why is deforestation happening? According to the FAO, agriculture causes around 80% of deforestation. And how does agriculture cause so much deforestation? According to the same report, 33% of agriculture-caused deforestation is a consequence of subsistence agriculture – such as local peasant agriculture in developing countries.

Commercial or industrial agriculture (field crops and livestock) cause around 40% of forest loss – in the search for space to grow food, fibers or biofuel (such as soybeans, palm oil, beef, rice, maize, cotton and sugar cane). It is also particularly interesting to note livestock is believed to be responsible for about 14% of global deforestation. The main reasons why have to do with the large areas require both to raise livestock but also to grow its (soy-based) food.

Deforestation in Europe

Change in forest cover during period:

Tabulka 2: Vývoj rozlohy lesa mezi léty 1700 a 2005 a podíl lesa v roce 2005 za světové makroregiony (v % rozlohy makroregionů)

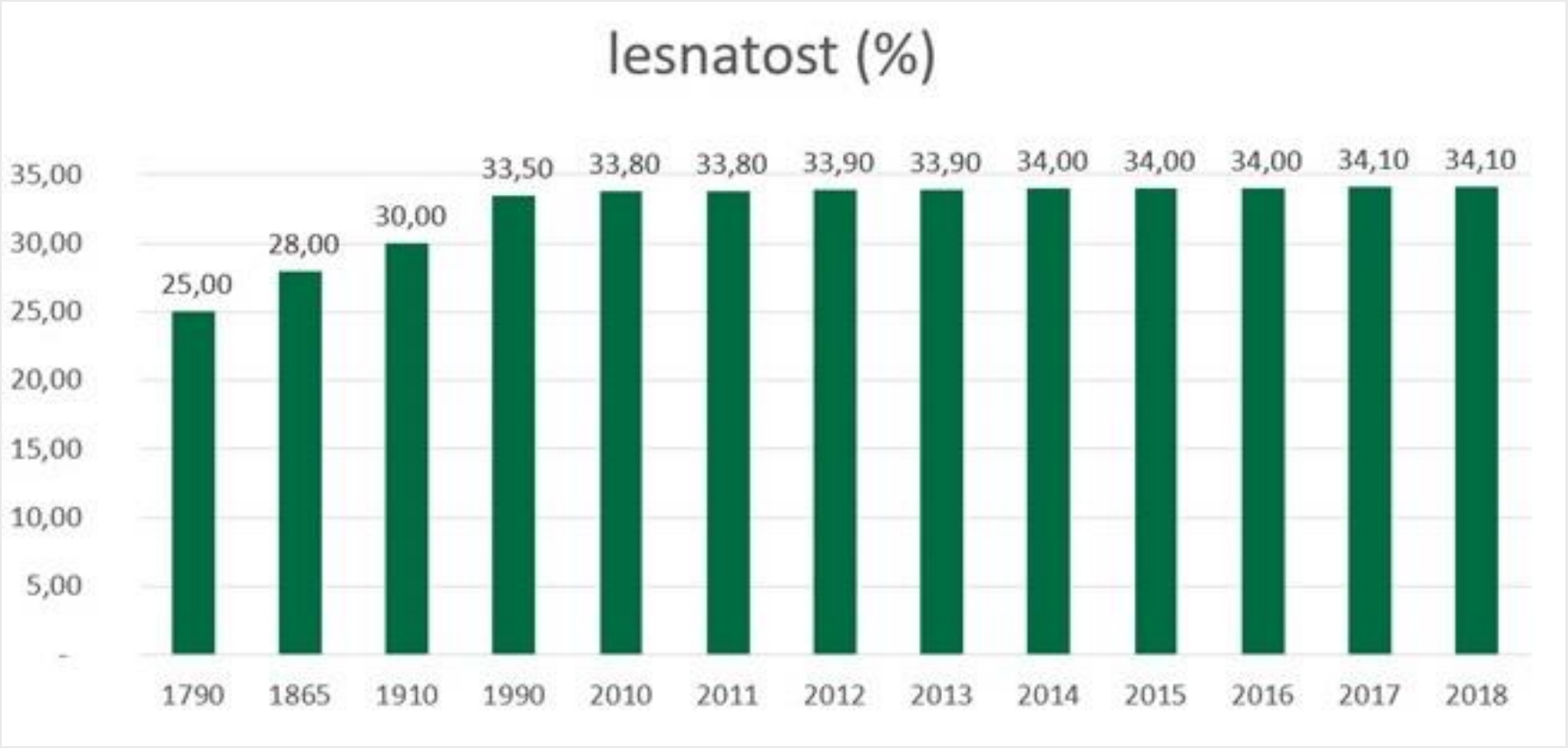
	Změna rozlohy lesních porostů 1700–1850	Přeměna lesů a lesních pozemků na ornou půdu 1860–1978	Změna rozlohy lesů a lesních porostů 1961–1981	Změna rozlohy lesů 1990–2005	Podíl lesů na celkové rozloze 2005
Afrika	-0,88	-1,58	1,27	-2,16	21
Asie (bez býv. SSSR)	-2,16	-4,54	-0,38	-0,11	21
Evropa (bez býv. SSSR)	-5,29	-1,71	2,50	2,32	35
Býv. SSSR	-3,23	-2,62	0,68	0,06	39
USA + Kanada + Grónsko	-2,39	-3,41	-0,15	0,24	33
Latinská Amerika	-1,24	-3,18	-3,28	-3,40	46
Oceánie	0,00	-4,26	-3,59	-0,74	24
Svět	-1,91	-3,05	-0,32	-0,96	30

Zdroj: FAO, Turner (1990), Revelle (1984)

Afrika
Asie
CCCP
USA

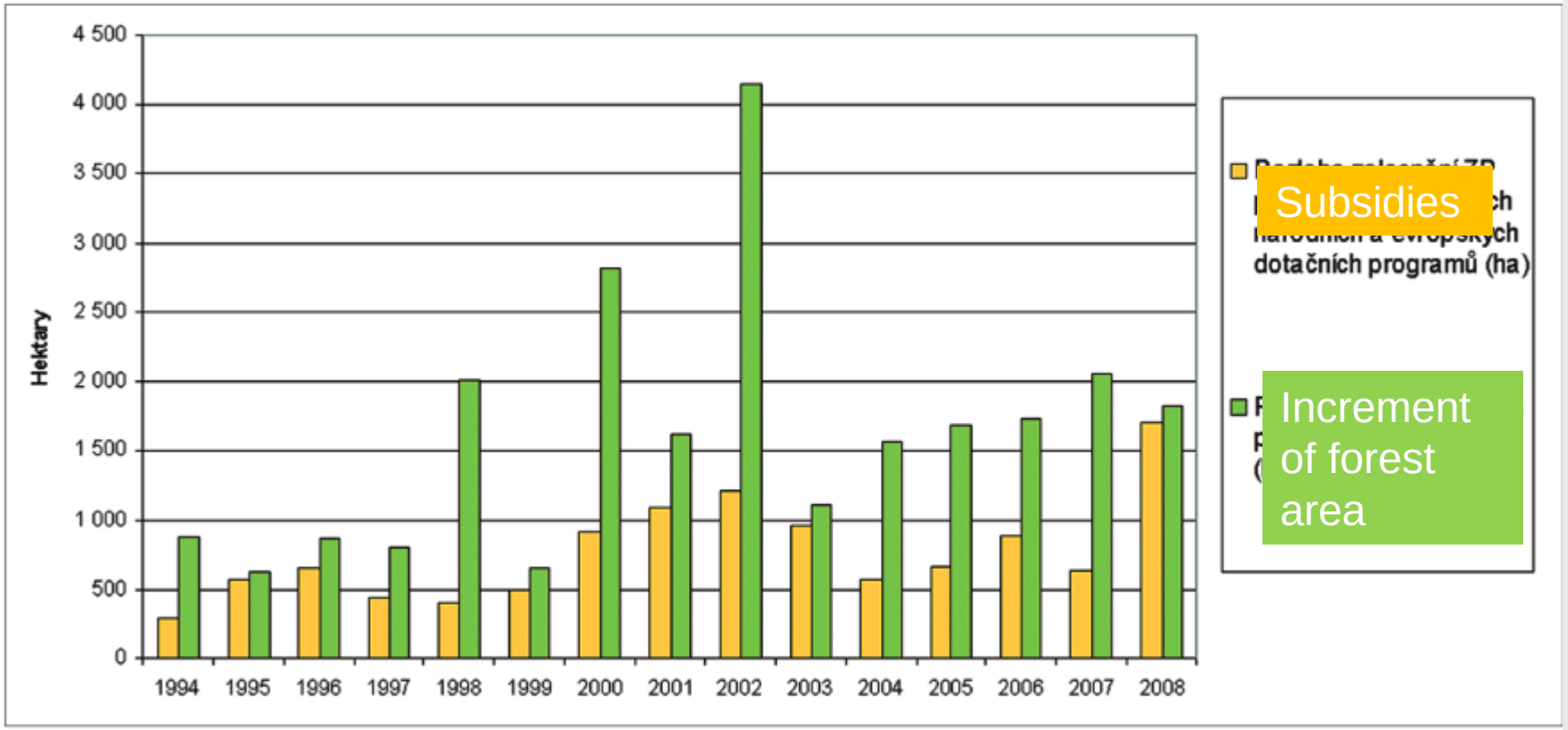
Deforestation in the Czech Rep.

Forest cover in the Czech Republic



Afforestation in the Czech Republic

Změna rozlohy lesních ploch v Česku podle údajů katastrálního úřadu a rozloha zemědělské půdy zalesněné s pomocí dotací v letech 1994–2008 (ha)



Zdroj: ČÚZK, ČSÚ; MZe, SZIF

Pozn.: Údaje o rozloze zemědělské půdy zalesněné pomocí dotací (z různých národních programů pro roky 1994–2004, z Horizontálního plánu rozvoje venkova pro roky 2004–06 a z Programu rozvoje venkova od roku 2007) jsou pouze orientační.

Way of regeneration: Regeneration – establishment – natural forest expansion

Combination in regeneration beech artificially, spruce naturally

Regeneration:

- Natural
- Artificial
- Combination

Establishment:

- Artificial

N. For. Expansion:

- Natural

Combination of natural expansion and artificial regeneration in large disturbance area

Natural regeneration – dividing

Generative:

seed trees

seed

Vegetative:

trees – stumps- root sprouts/suckers

Natural regeneration – first

- More naturals
- Less expensive

Light demanding species

- More prerequisites for creation stabile, diverse forest
- But not always ….

Shade tolerant species

Natural regeneration – limits

Stands conditions:

- Species composition
- Trees qualities
- Number and distribution of trees
- Trees ages

Environmental conditions:

Germination beds (soil):

Stand structure – limits of natural regeneration

Conversion of species composition

Low genetic quality

Number and spatial distribution of trees

Age of mature trees

Number and spatial distribution of trees

Anemochory

Zoochory

Barochory

Hydrochory

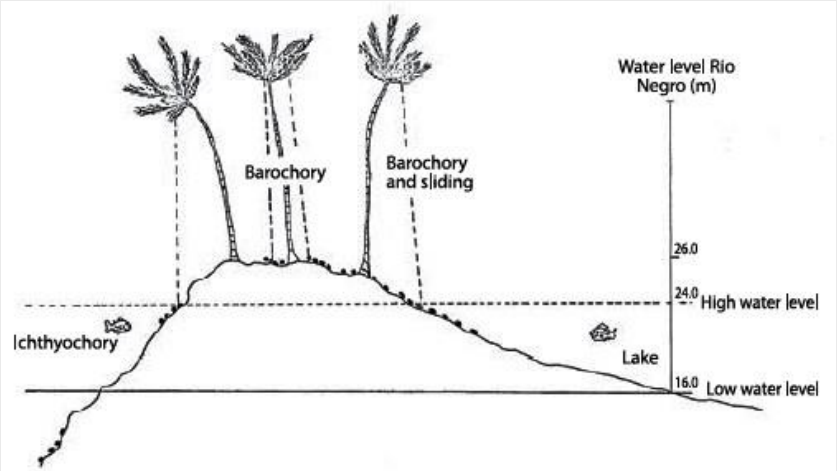
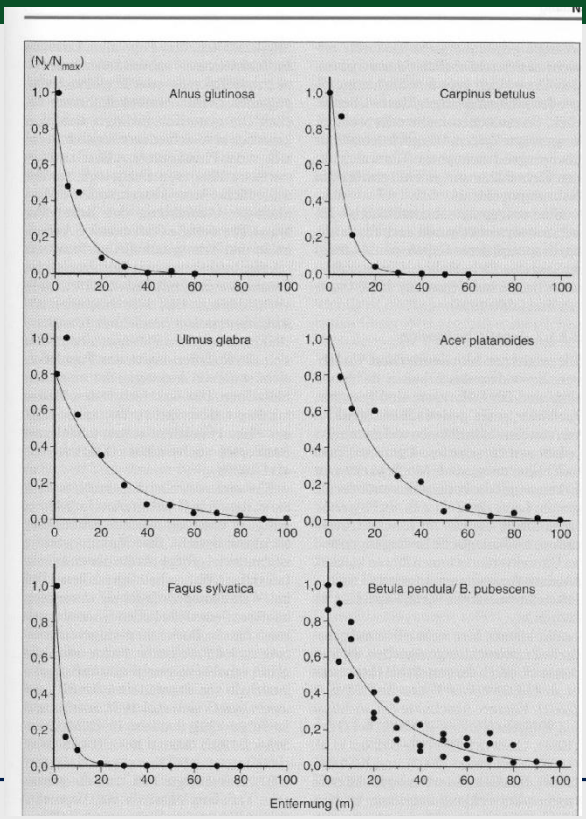


Fig. 2. Reproductive phenology of *A. jauari* in the study site near the Anavilhanas Ecological Floating Station (AEFE) in the Anavilhanas Archipelago, Rio Negro, Central Amazonia, with river level and precipitation. Young fruits are defined as green, less than 3 cm wide; mature fruits as yellowish.



Artificial regeneration:

- Not mature trees in adequate ages, number, densities, qualities;
- Not fructification of trees;
- Not climatic and soil conditions for germination and survive of young seedlings;

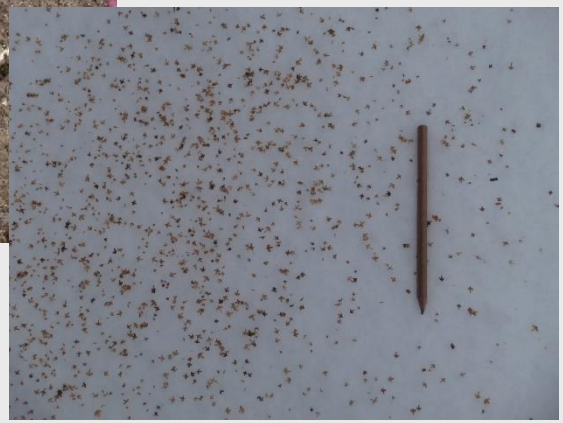
Artificial regeneration:

Seeding:

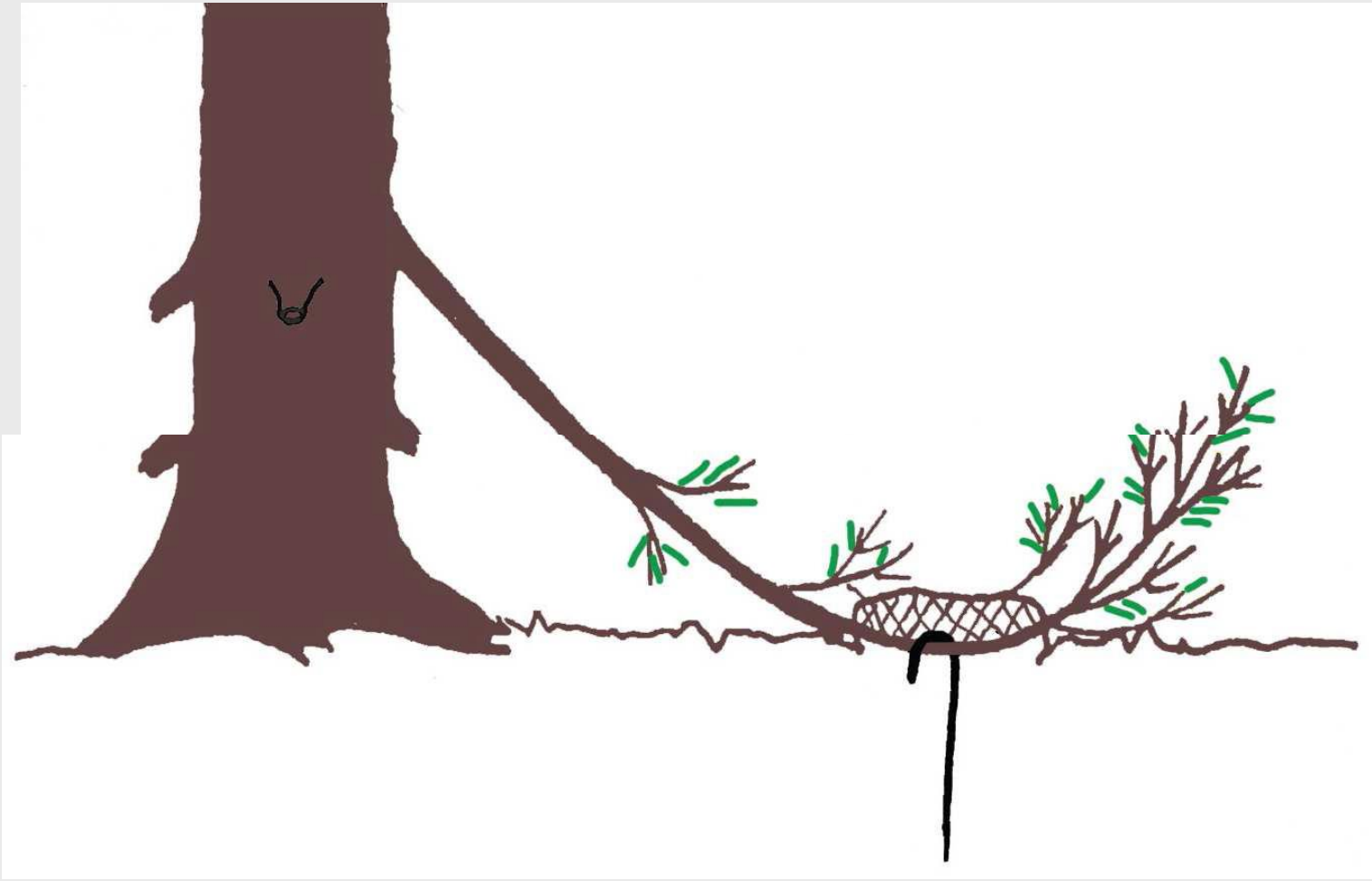
- limited number of species and stands conditions
- lower success – higher seed consumption

Planting:

- more expensive
- lower tree stability and vitality



Artificial regeneration – vegetative way



Species selection and creation of forest mixture

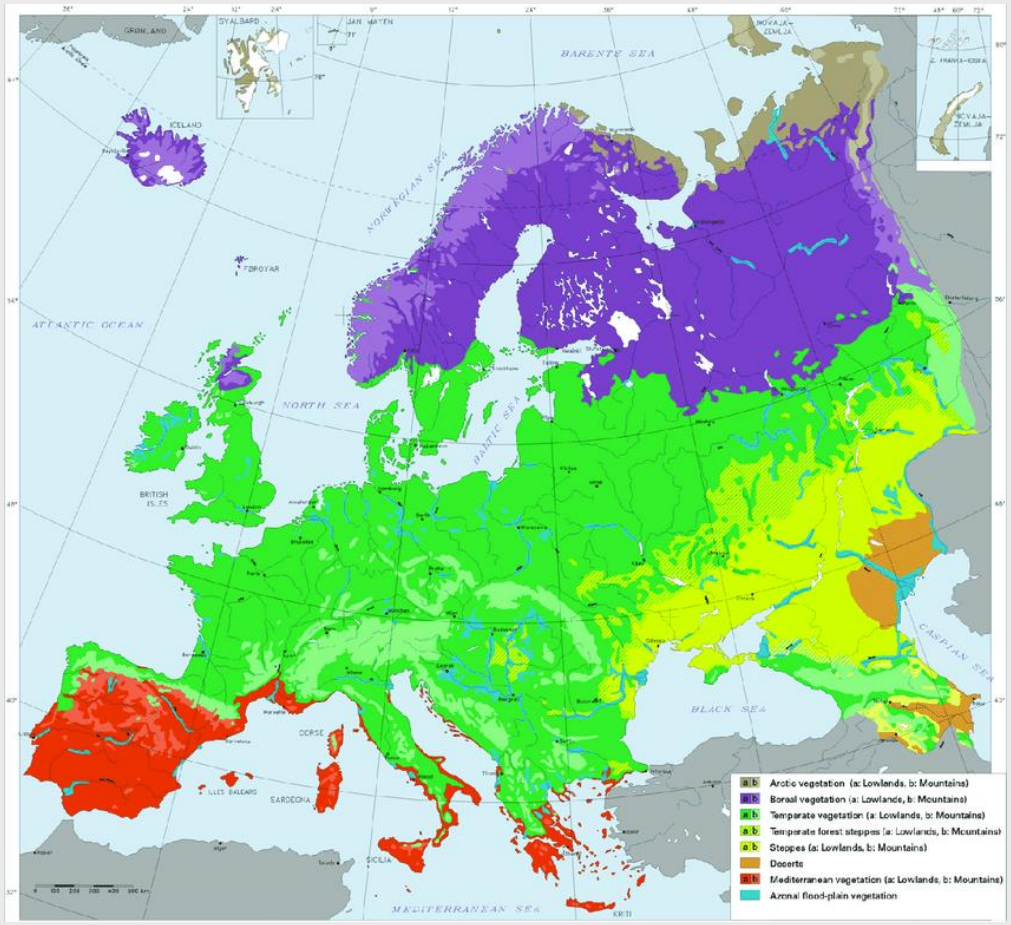
Species selection – one of tee most important silviculture decision

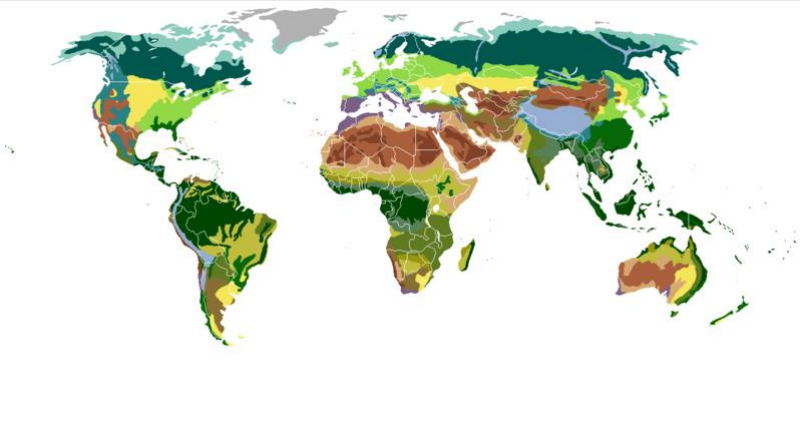
Forest for future generation

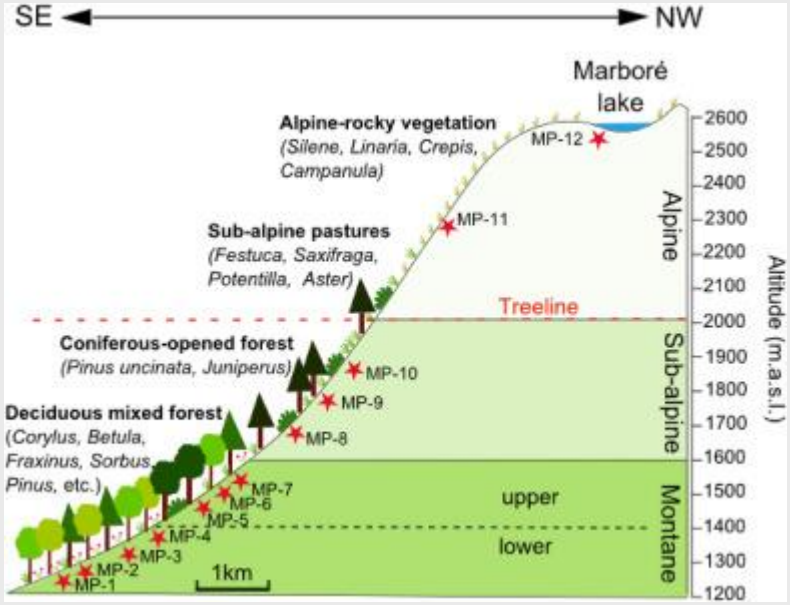
Factors:

1. Site conditions
2. Stands conditions
3. Economic goal

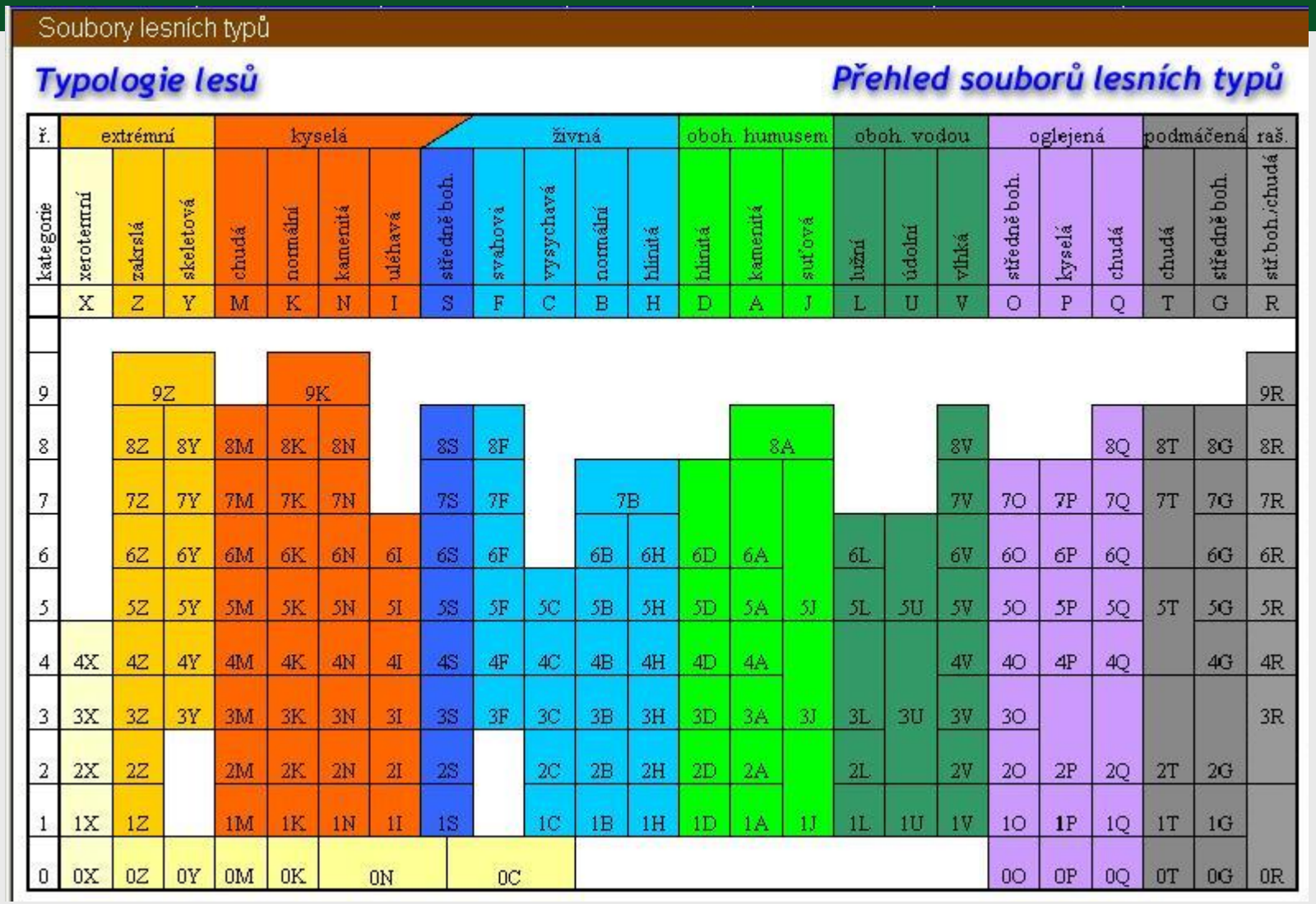
Species selection and site conditions





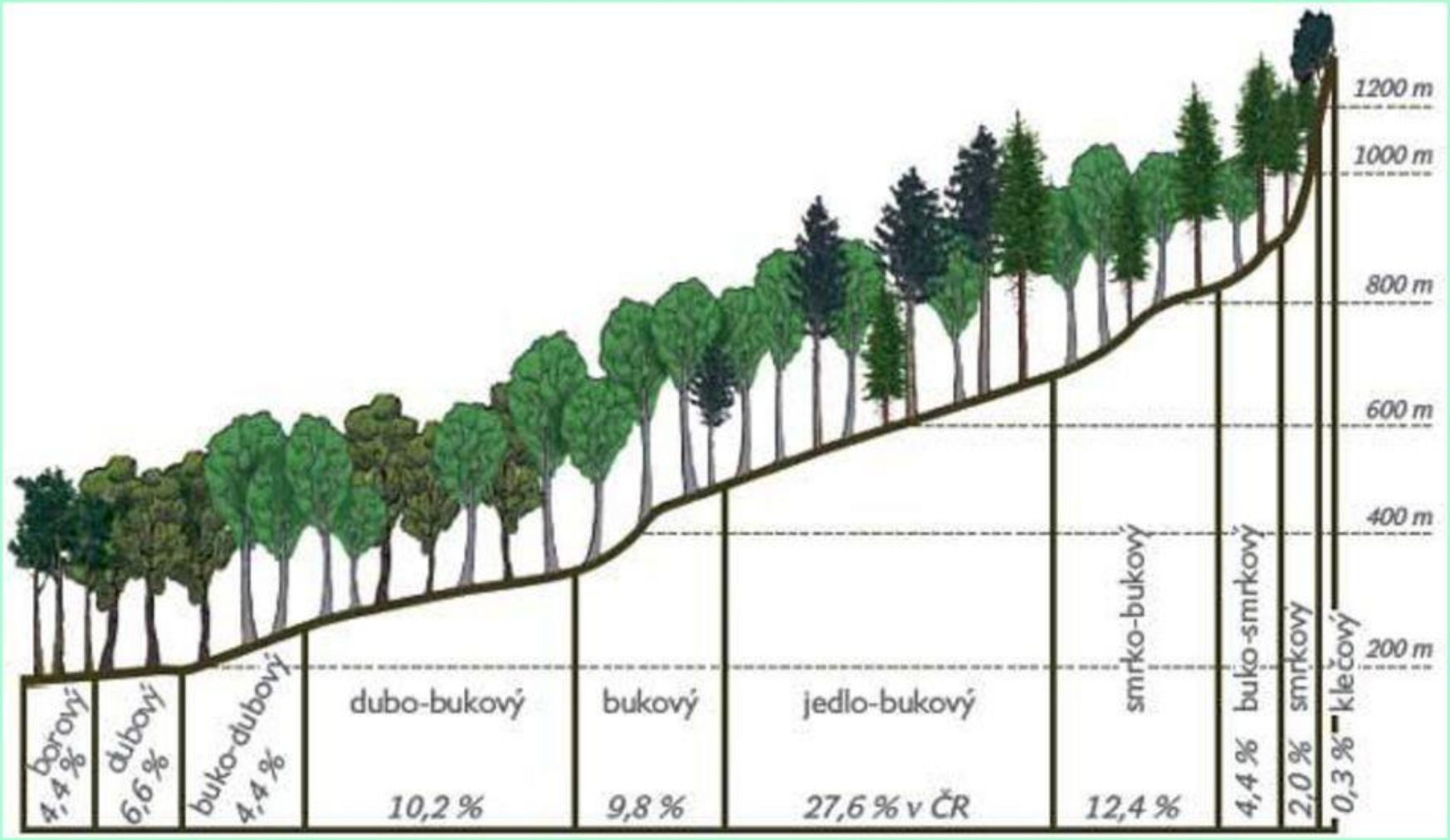


Species selection and site conditions



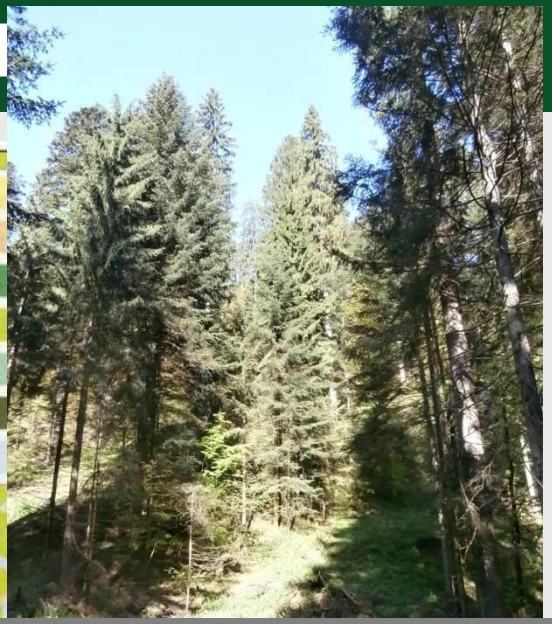
Species selection and site conditions

Forest vegetation zone in the Czech Republic



Potential vegetation of central Euro

Beech often in monoculture

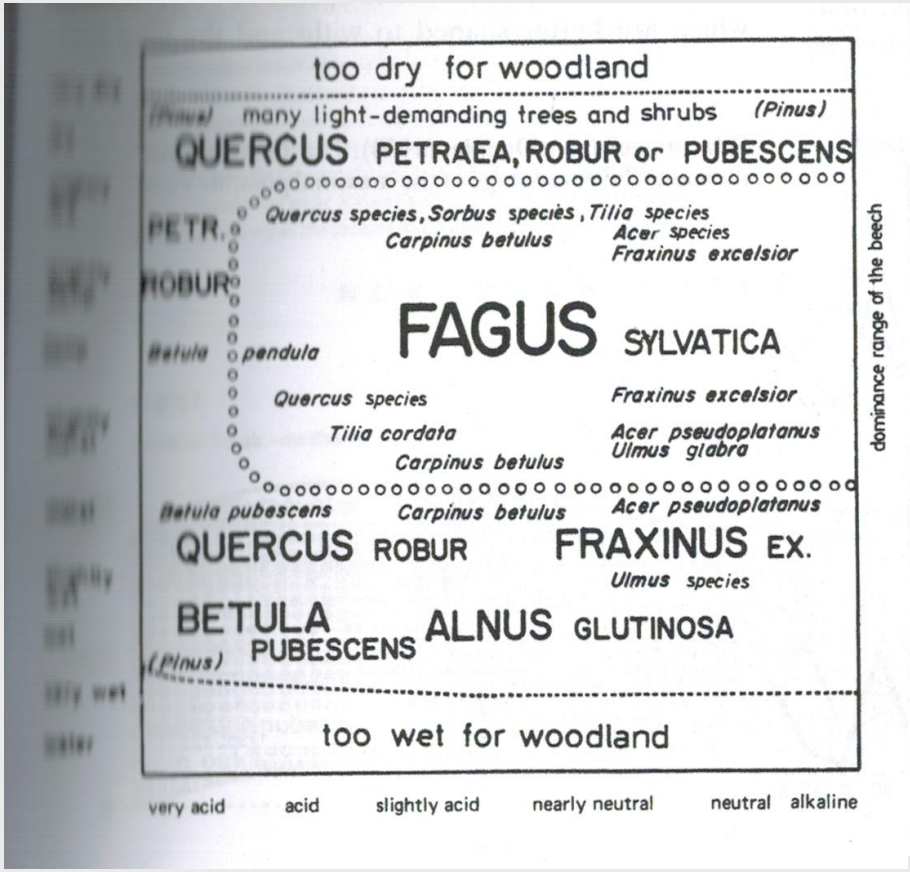


Beech, silver fir, spruce

Oak + more broadleaved

Spruce and broadleaved

Species selection and climatic change



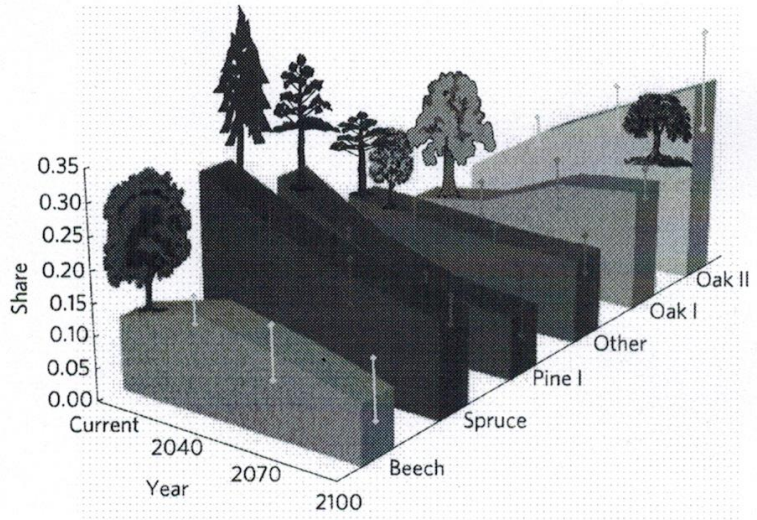


Figure 3 j Development of the share of the area of major tree species in Europe under scenario A1B until 2100. The relative size of the icons approximately corresponds to the relative height of mature trees of the species groups. The tree species group labelled 'Other' includes Pine II, Birch and Other spp. from Figs 1 and 2. The bars reflect the standard deviation resulting from four different model realizations of scenario A1B (see Supplementary Tables S5 and S6).

H. Ellenberg – vegetation ecology of Central Europa

Hanewinkel et al. Climate change may cause severe loss in the economic value of European forestland

Stand conditions:

R (ruderal), C (climax) , or R- C- S strategy

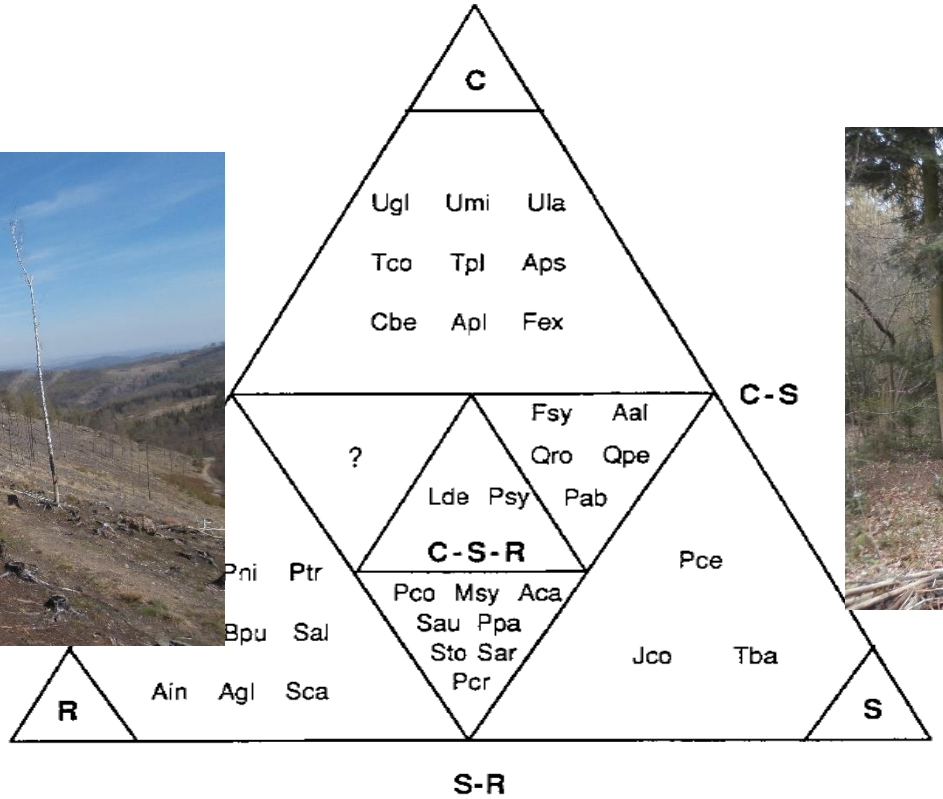
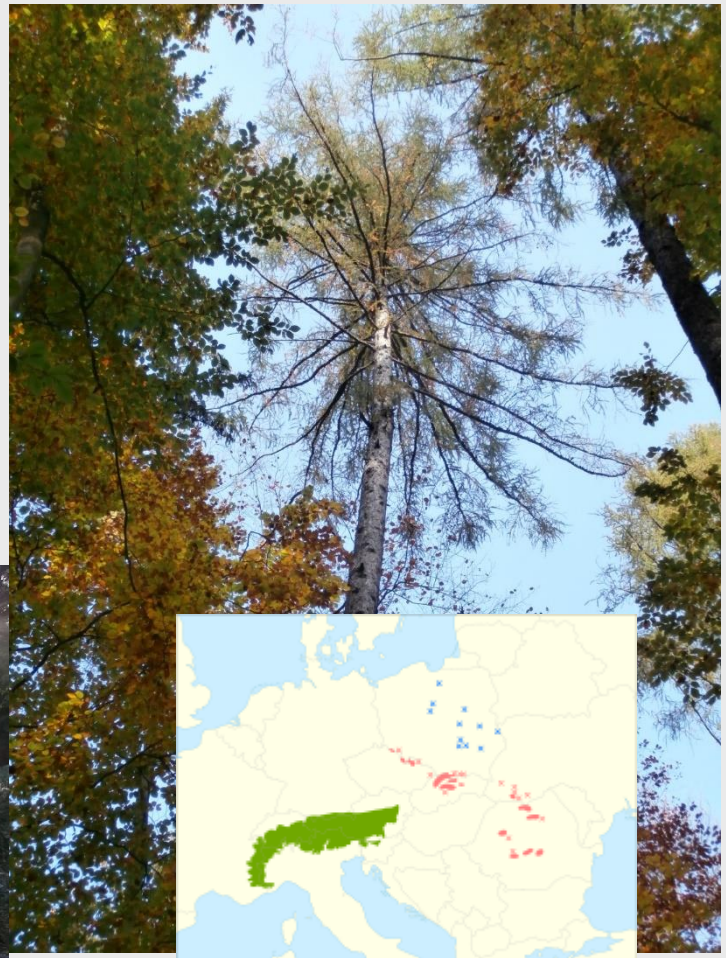


Fig. 4. Application of the triangular model of Grime (1977, 1979) as a basis for classification of life-history strategies of major European tree species: R, ruderals; C, competitors; S, stress tolerators; S–R, stress-tolerant ruderals; C–S, competitive ruderals; C–R, competitive ruderals; C–S–R, competitive stress-tolerant ruderals. See text for further explanations.

Species selection - economic goal:

Native – non native species – rare species



Creation of forest mixture

Mixture forest is more stabile and profitable

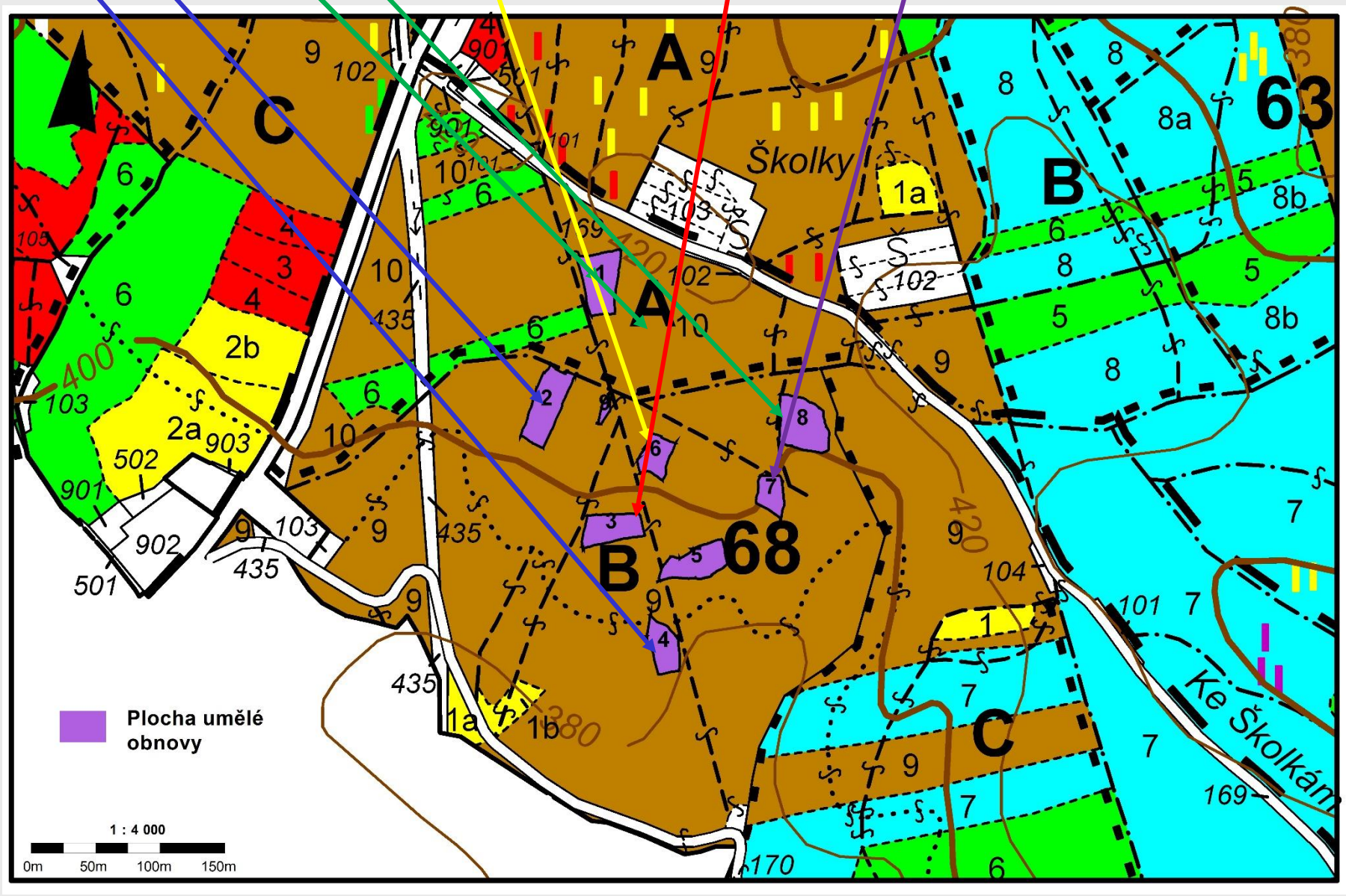
- In shelterwood regeneration systems
- In the process of forest transformation
- After large disturbances
- In gaps and as underplation
- In clearing

Mixure - in shelterwood or seed trees regeneration systems (natural reg.)

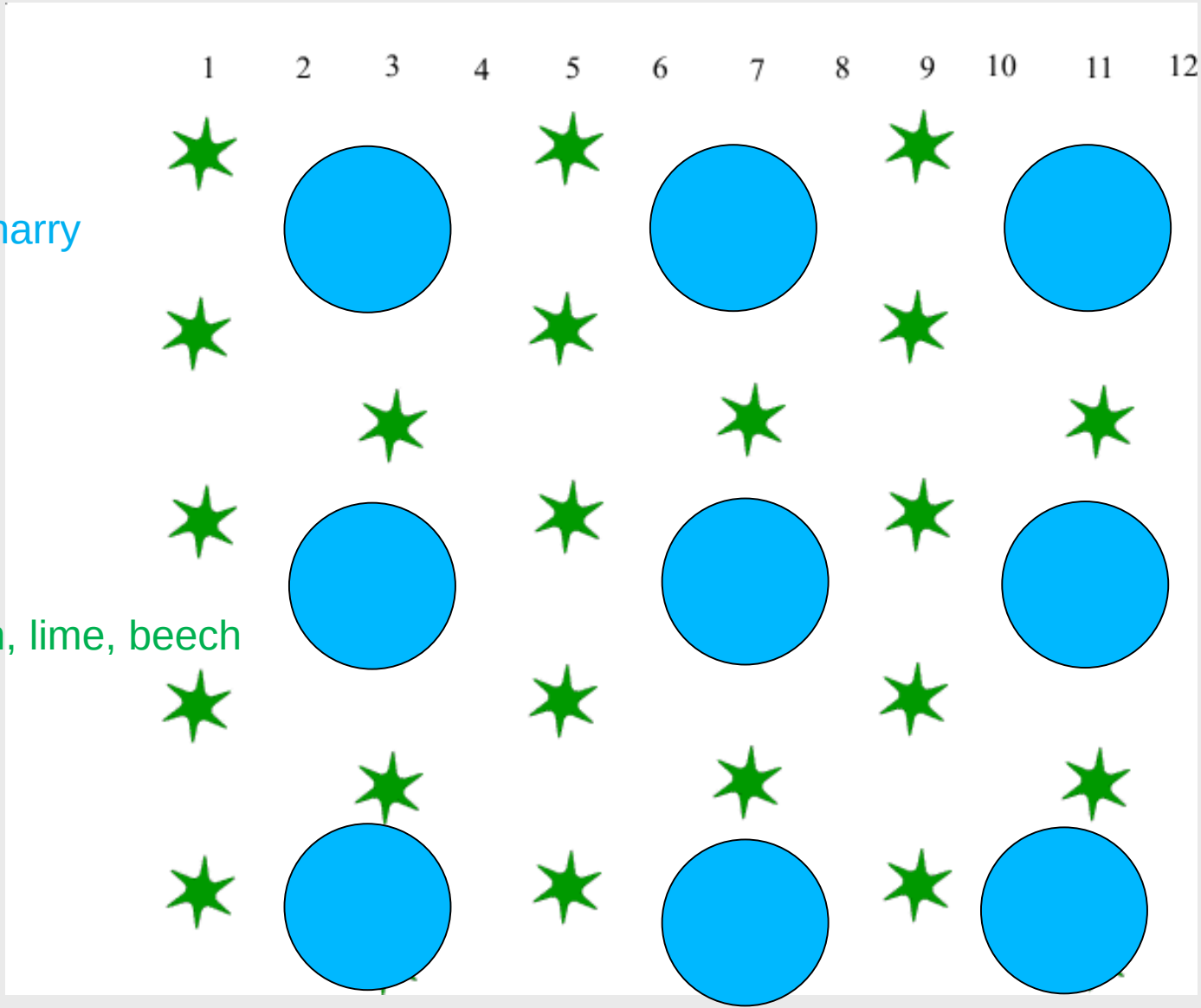
In the process of forest transformation

Mixture - In clearing

- Light demanding + shade tolerant
- Fast growing + sensitive slow growing
- Vulnerable + nurse species


beech
oak
Douglas fir
maple
fir
Školky
Ke Školkám
Plocha umělé obnovy
1 : 4 000
0m
50m
100m
150m

Mixture - In clearing



Soil preparation:

Natural reg./ Seeding

- Improved seed beds

Planting

- Take root better

- Limits growth of weed
- Improved environmental (soil) conditions for growth of plants
- Prevents population (damage) of rodent, insects

Soil preparation:

Mechanically

- deep and

Chemically

- Aerial, ground

Biologically

- trees and herbs

Whole area, patches, row

Soil preparation – mechanic way:

Shearing:

=MtK0v

Plawing, tillage

Piling:

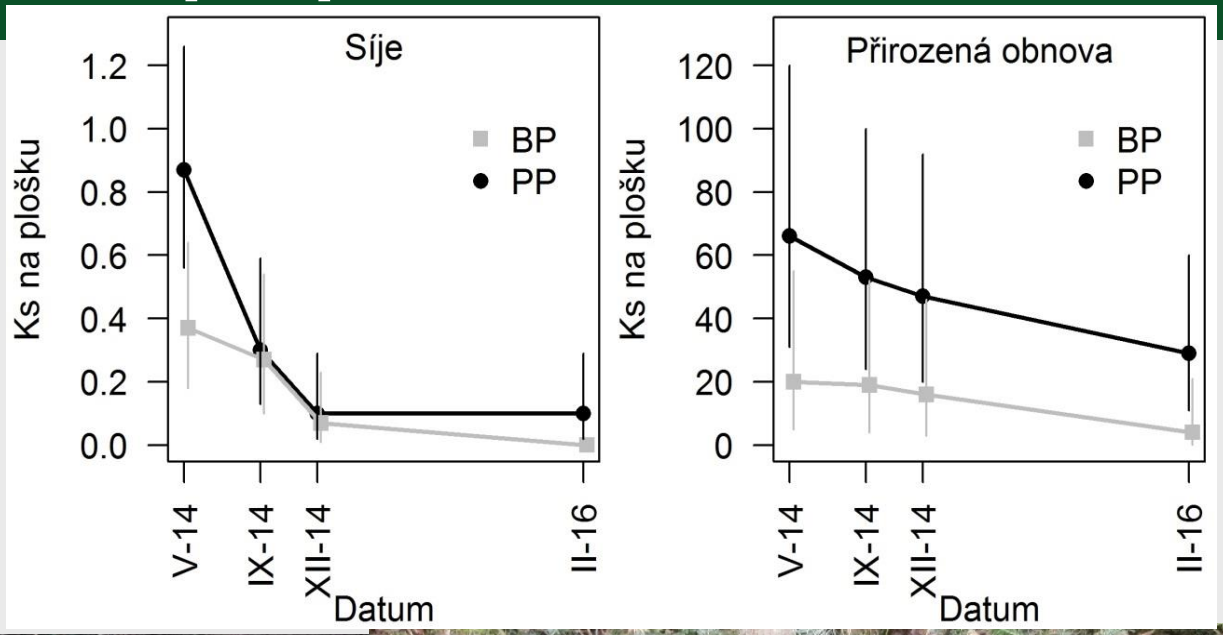
Hole digger:

Forest cultivator FU 4077, FU 4082 a FV 4088 (soil tiller – TFE Krtiny)

Impact of soil preparation

PP - Preparation

BP- Without preparation



Thank you for your attention