SIRT

Strategic Integrated Research in Timber

Edinburgh Napier UNIVERSITY

home grown timber

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In association with

The Wood Technology Society

A Division of the Institute of Materials, Minerals and Mining

The Queen's Anniversary Prizes

For Higher and Further Education

2015

Settings for UK timber

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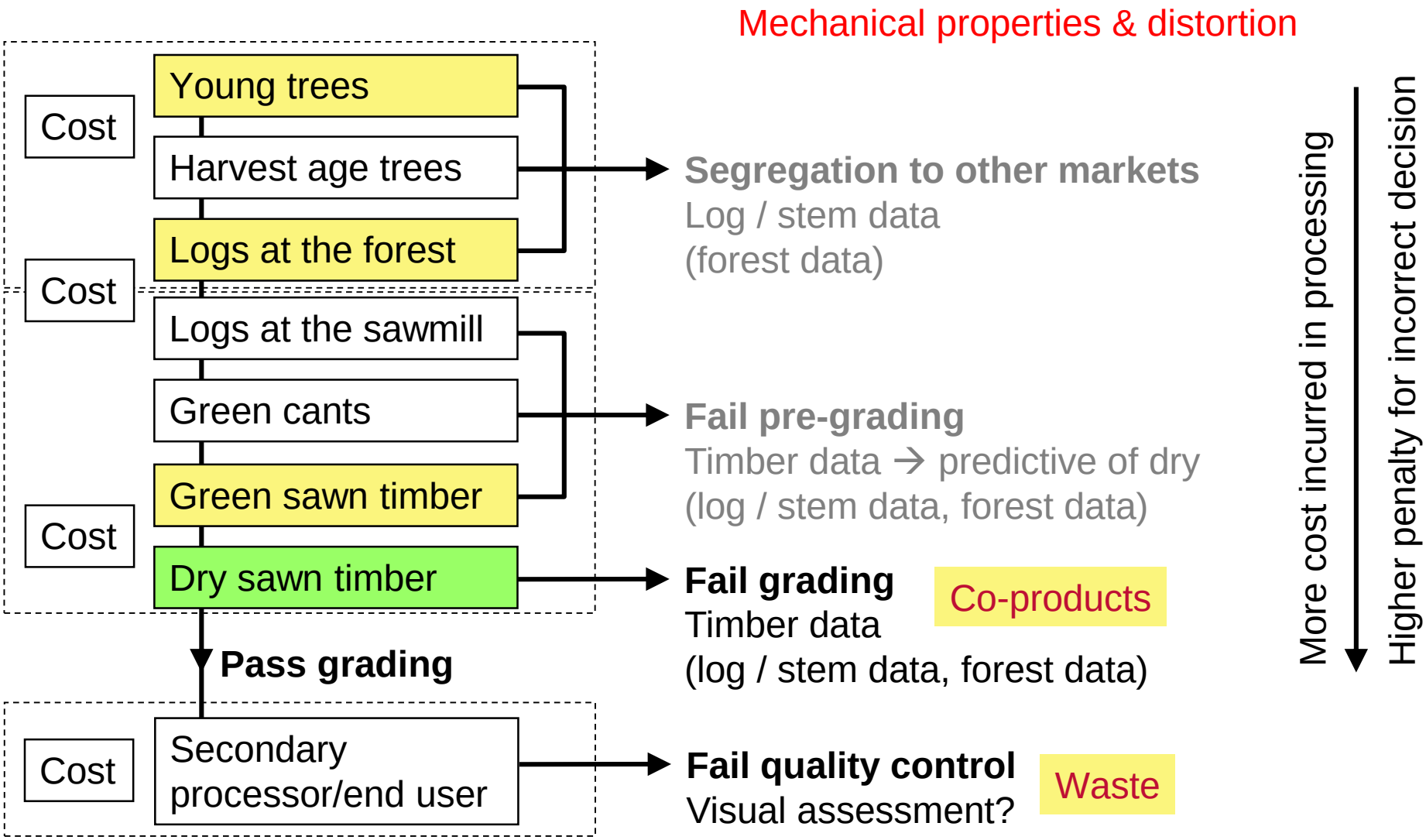
Machine name	Operation	Species
Brookhuis Micro-Electronics [& LuxScan]		
MTG 920 [and ESCAN]	Longitudinal frequency	British spruce, UK larch
MTG 960 [and ESCAN]	Longitudinal frequency & density (mass & volume)	British spruce, UK larch
Dynalyse AB		
Precigrader	Longitudinal frequency (microphones) & density (mass & volume)	British spruce
MPC		
Computermatic	Bending	British spruce, British larch, British pine
Cook-Bolinder	Bending	British spruce, British larch, British pine
MiCROTEC		
ViSCAN	Longitudinal frequency (laser vibrometer)	British spruce, UK larch
ViSCAN-Compact	Longitudinal frequency (laser vibrometer) & density (mass & volume)	British spruce, UK larch
ViSCAN-Plus	Longitudinal frequency (laser vibrometer) & density (X-ray)	British spruce, UK larch
ViSCAN-portable	Longitudinal frequency (laser vibrometer) &, optional, density (mass & volume)	UK larch
GOLDENEYE GE702	X-ray (knots & density)	British spruce, UK larch
GOLDENEYE GE706	X-ray (knots & density) & longitudinal frequency (laser vibrometer)	British spruce, UK larch

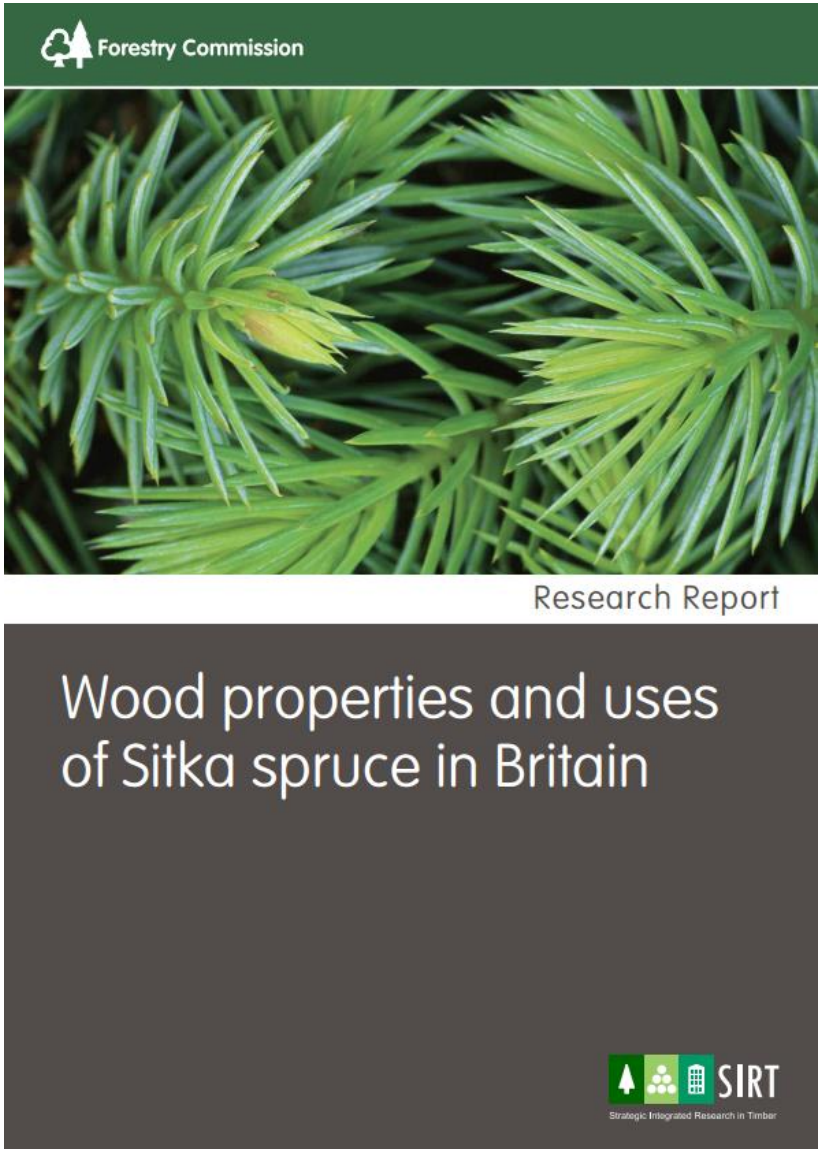
= Done by Edinburgh Napier University

Grading and segregation



Species studied

- Grading settings studies
  - British spruce (90% Sitka, 10% Norway)
  - UK larch (17% European, 83% hybrid & Japanese)
- PhD research projects
  - Douglas-fir
  - Norway spruce, western hemlock, western red cedar, noble fir
- Current and future research
  - Pacific silver fir, Japanese red cedar, Serbian spruce, European silver fir, sycamore, birch, grand fir



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What we knew about the UK's Sitka spruce resource.

…At the time published in 2011

http://www.forestry.gov.uk/pdf/FCRP015.pdf/$FILE/FCRP015.pdf

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Variation in British Spruce

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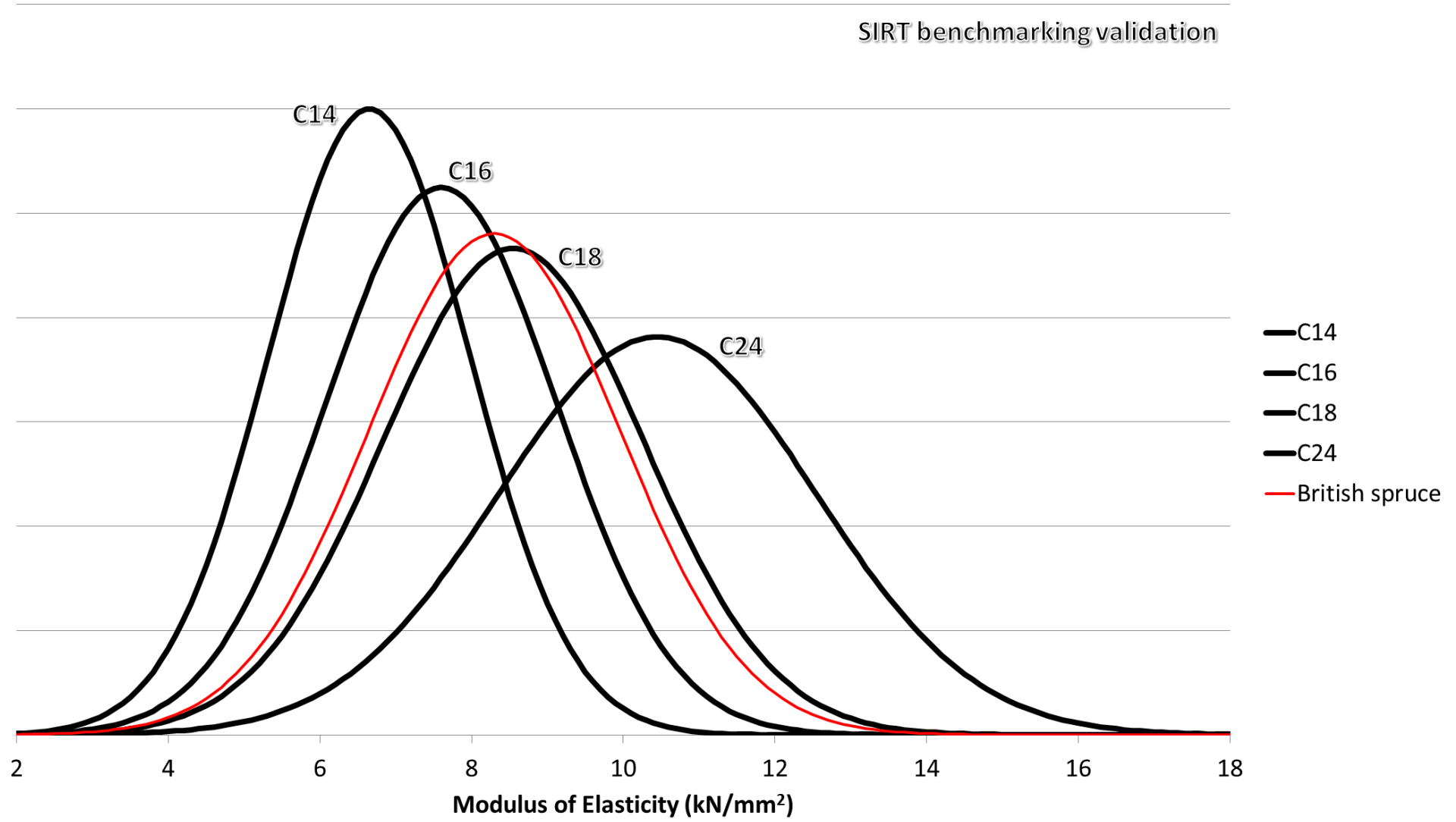

Variation in British Spruce

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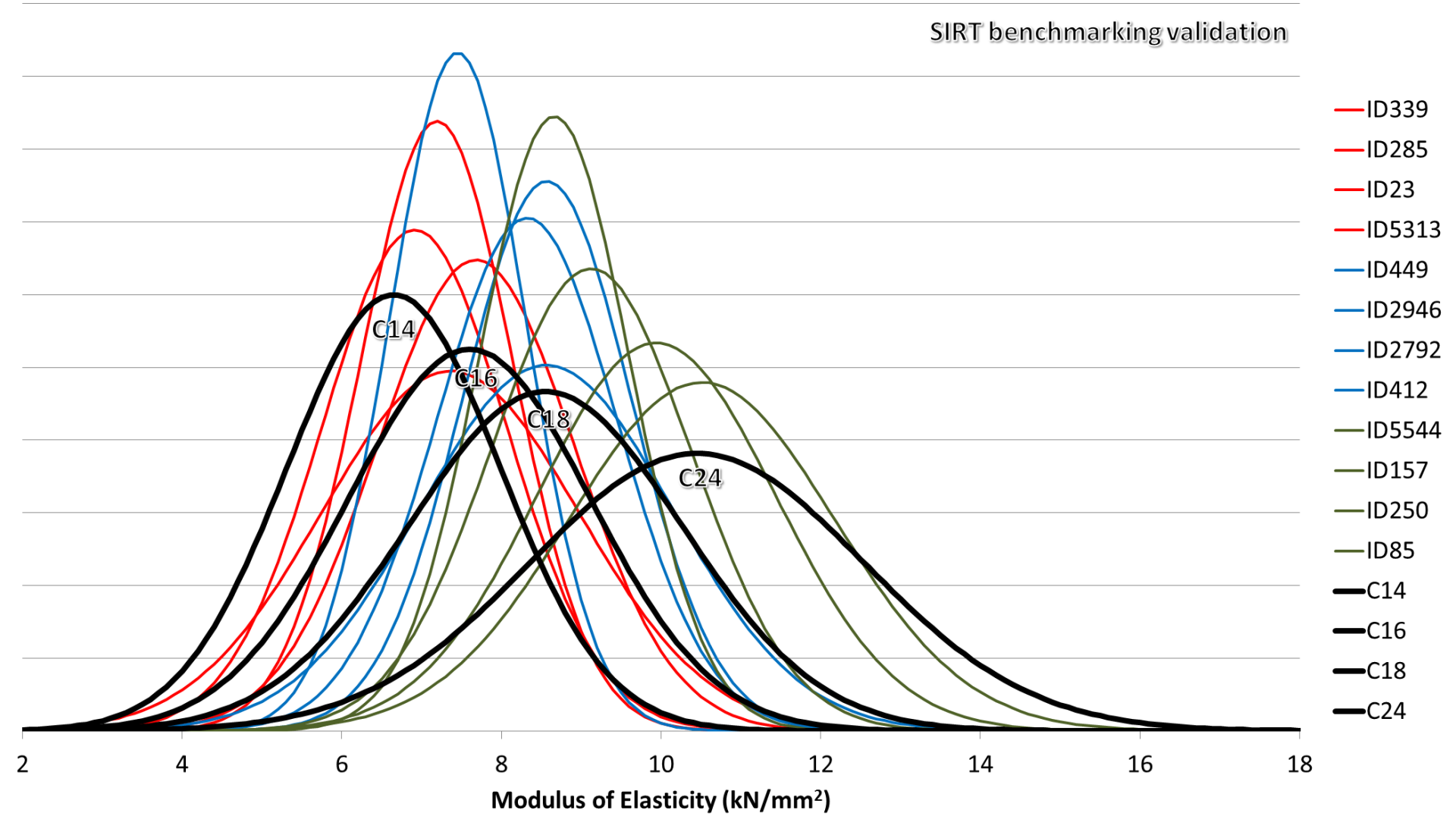


Critical property for UK spruce

British spruce: Sitka spruce and Norway spruce combined from UK and Ireland (WPCS)

SIRT benchmarking validation, 957 pieces

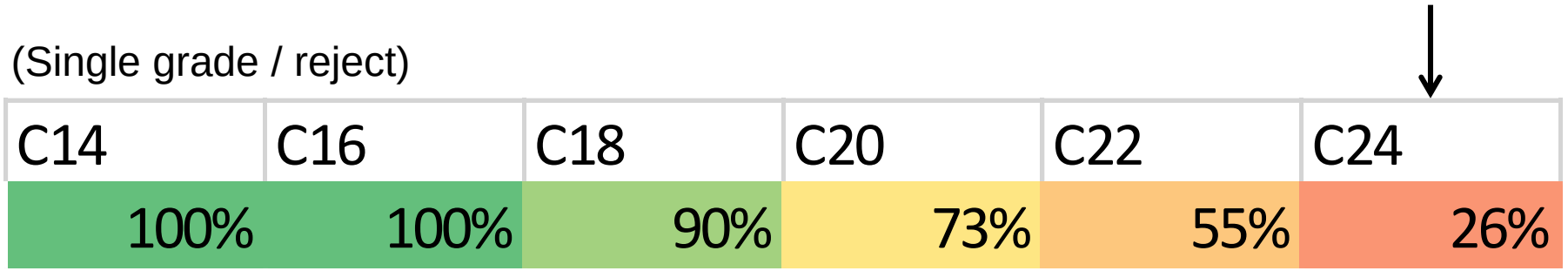
British spruce			C14	**C16**	C18	C20	C22
Strength	20.9	N/mm^2	14	16	18	20	22
Stiffness	8.2	kN/mm^2	7	8	9	9.5	10
Density	338	kg/m^3	290	310	320	330	340

It isn't density that is limiting

Approximate yields

(with a perfect grading machine)

The other 74% is C16



(Single grade / reject)

C14	C16	C18	C20	C22	C24
100%	100%	90%	73%	55%	26%

For higher grades, density becomes critical. Yield of C27 ~ 9%

“Rate of growth”

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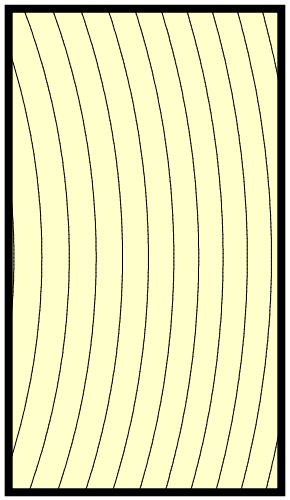
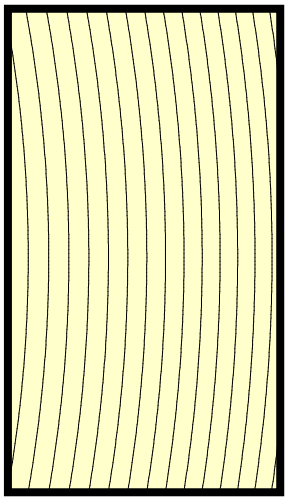
Grew in ~11 years



Grew in ~15 years



“Rate of growth”

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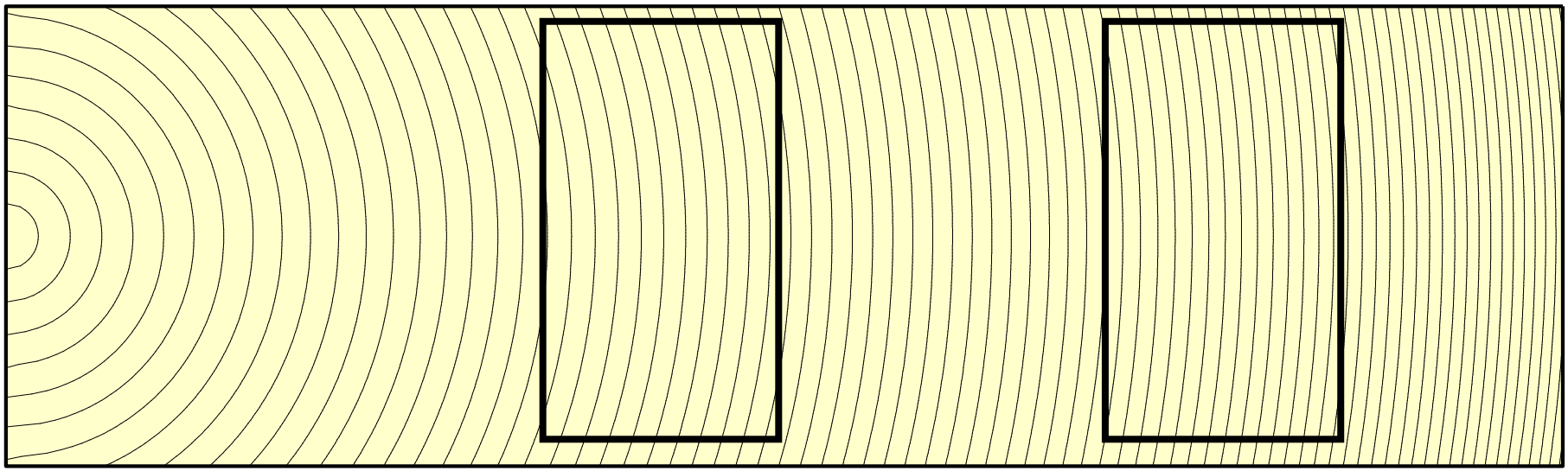

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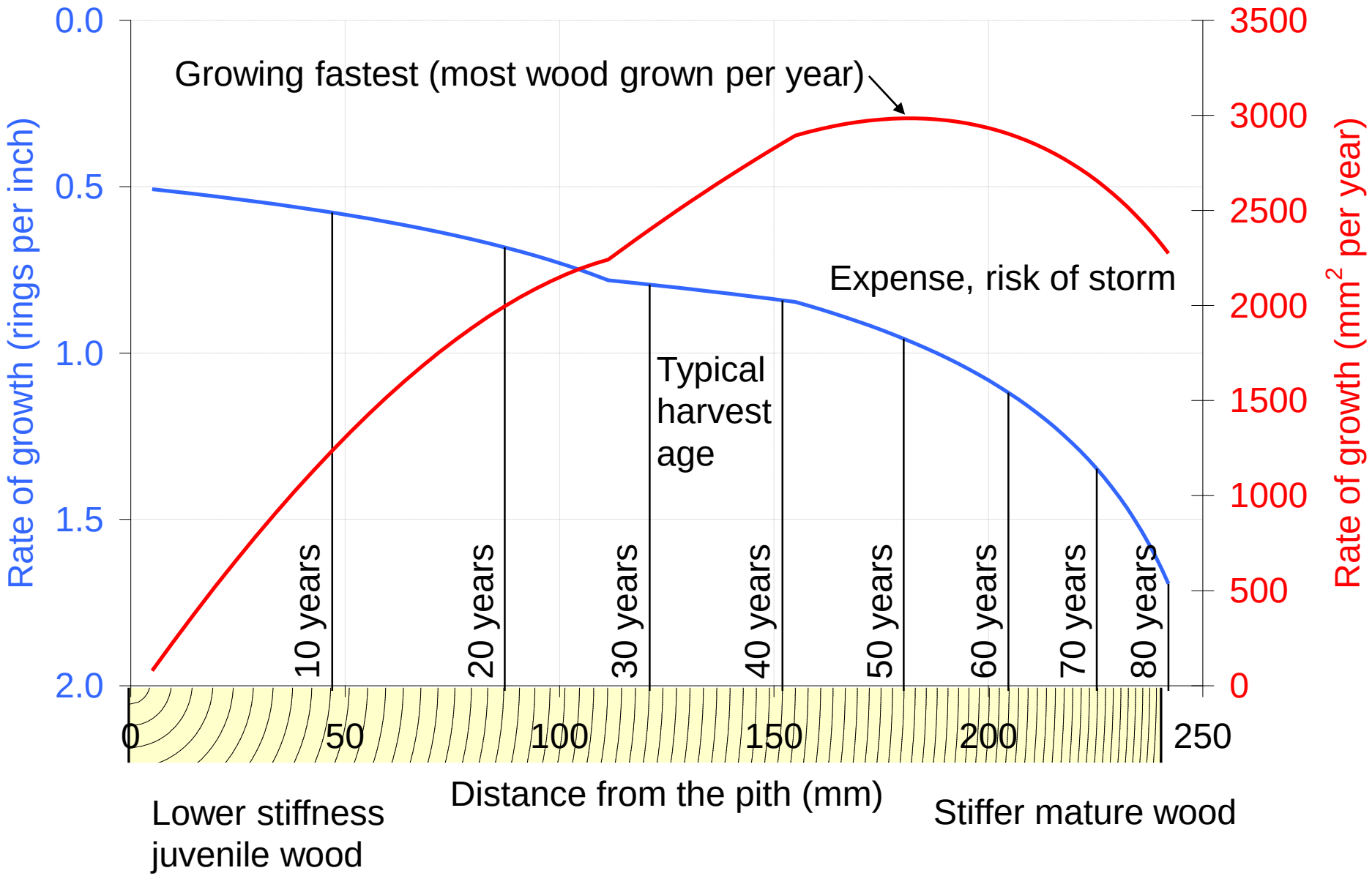

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Simulation of grading

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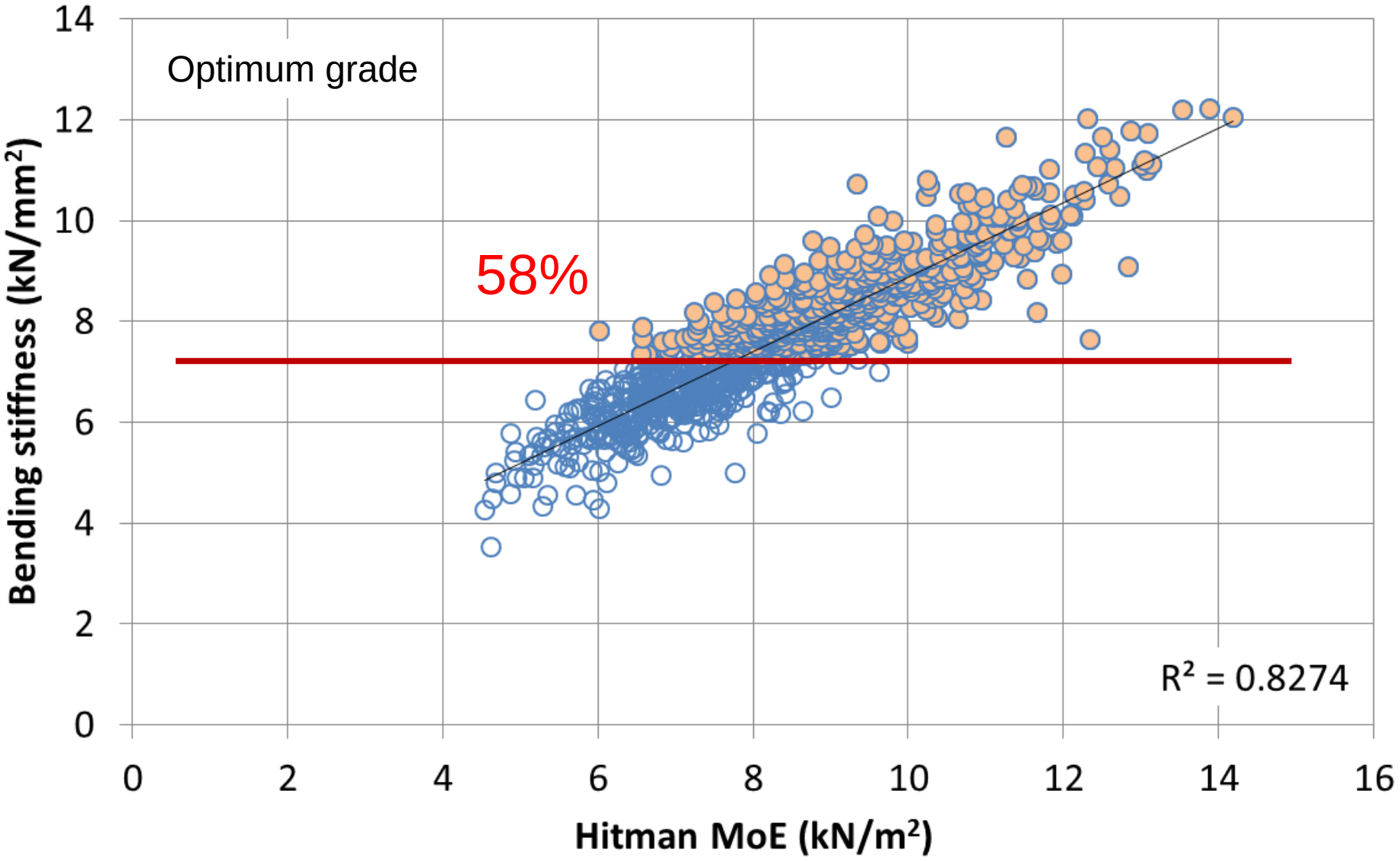

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Bending stiffness (kN/mm²)

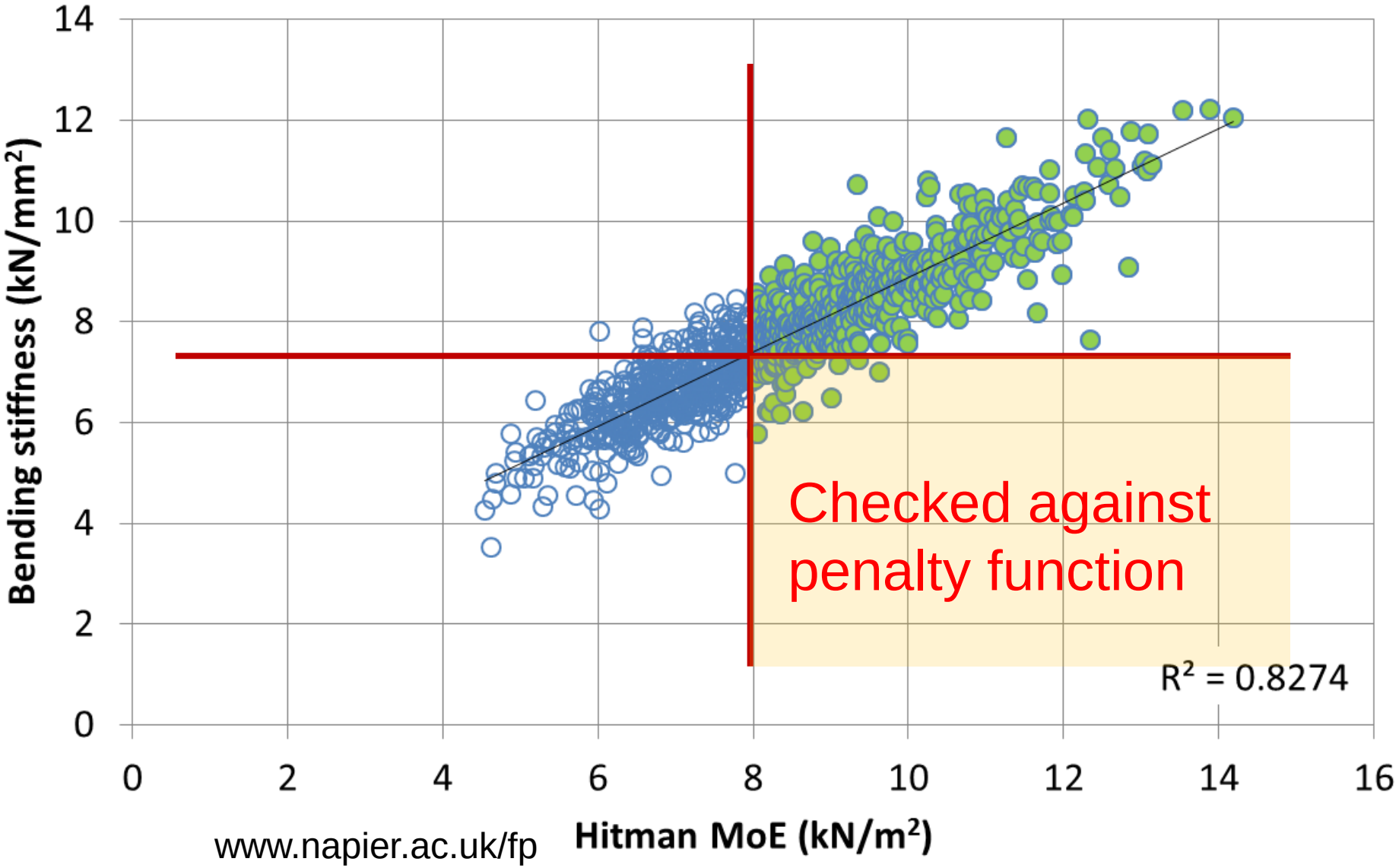
14
12
10
8
6
4
2
0

0 2 4 6 8 10 12 14 16

Hitman MoE (kN/m²)

55%

$R^2 = 0.8274$


Bending stiffness (kN/mm²)
Hitman MoE (kN/m²)
0
2
4
6
8
10
12
14
16
Checked against
penalty function
R² = 0.8274

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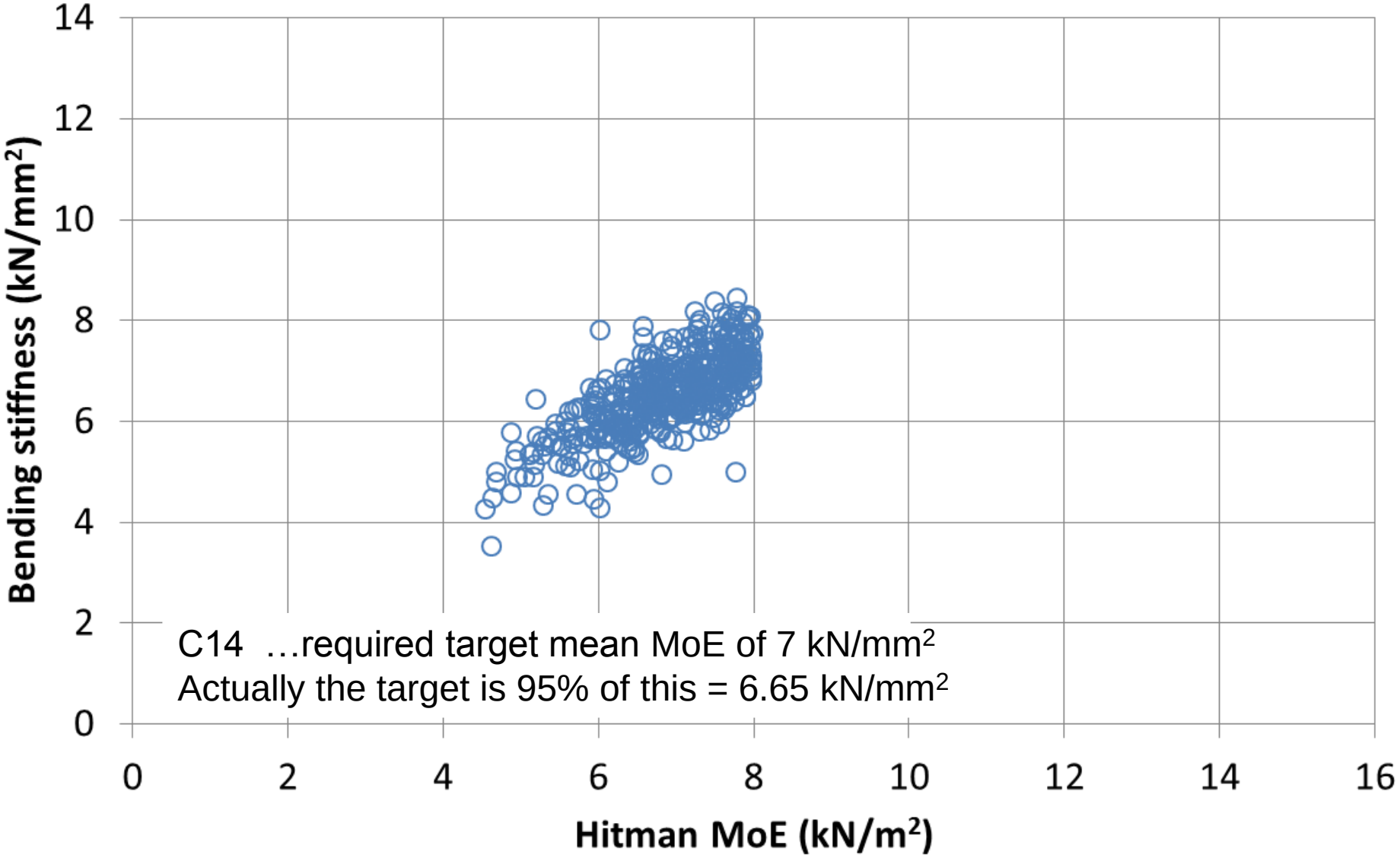

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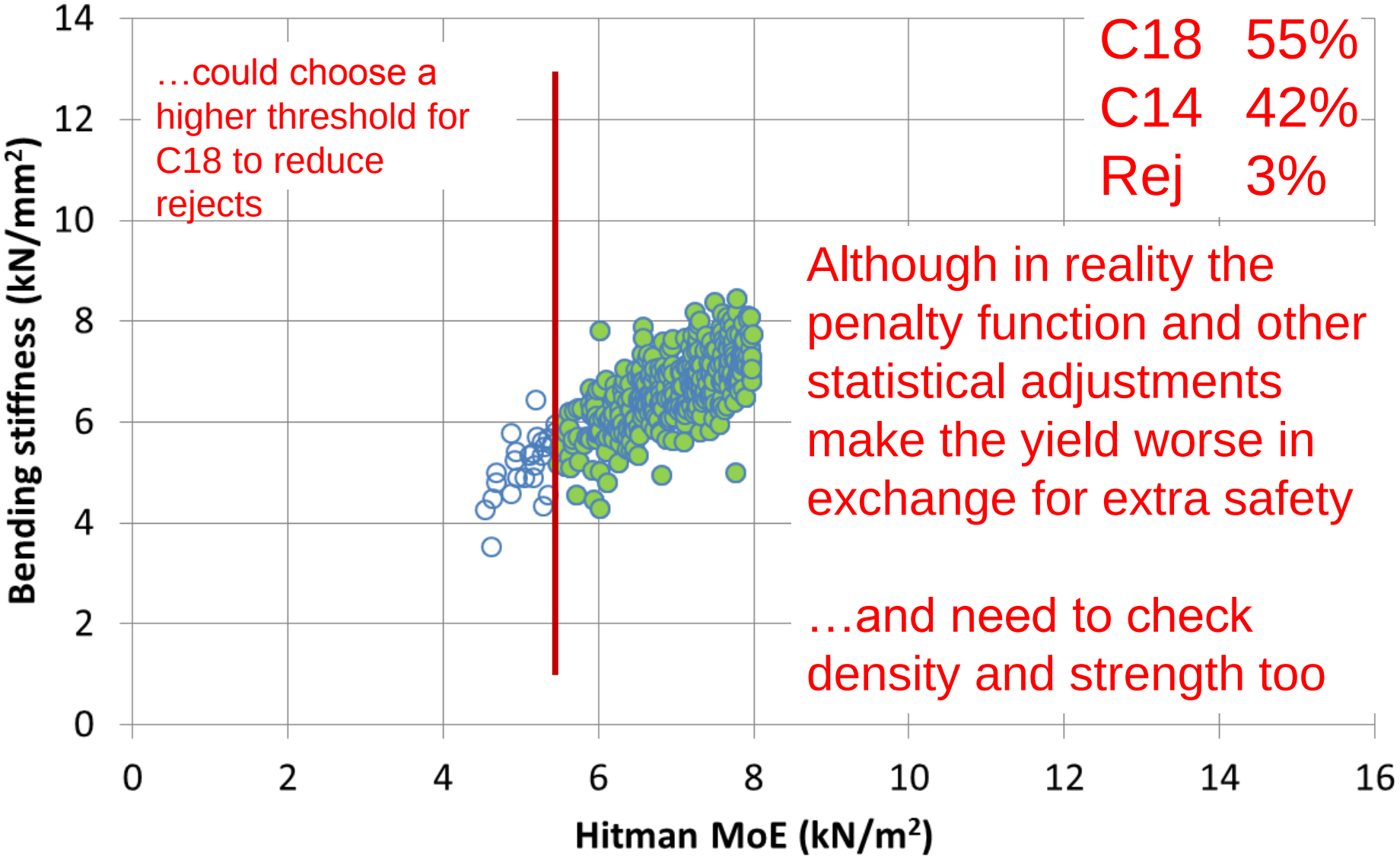
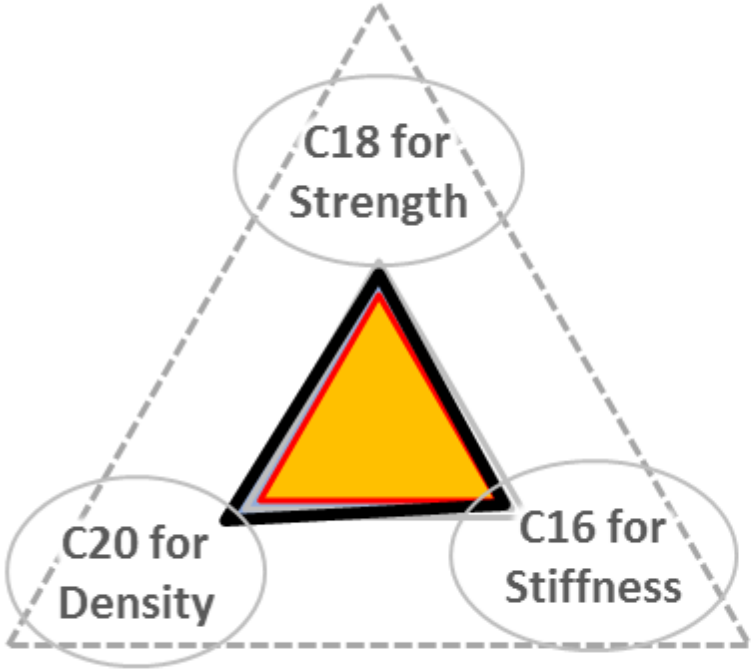
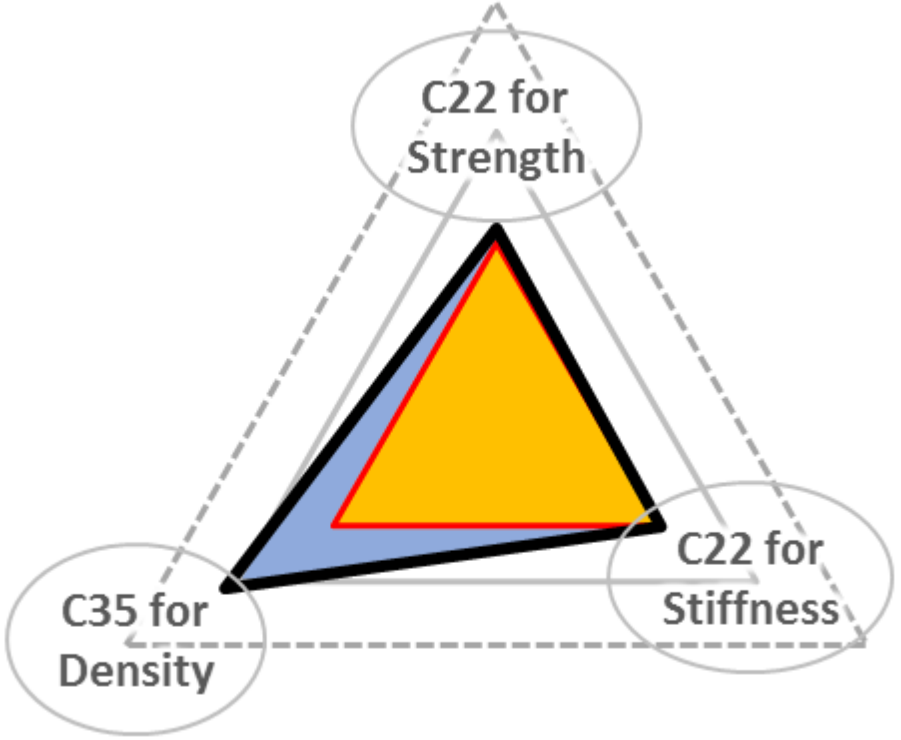


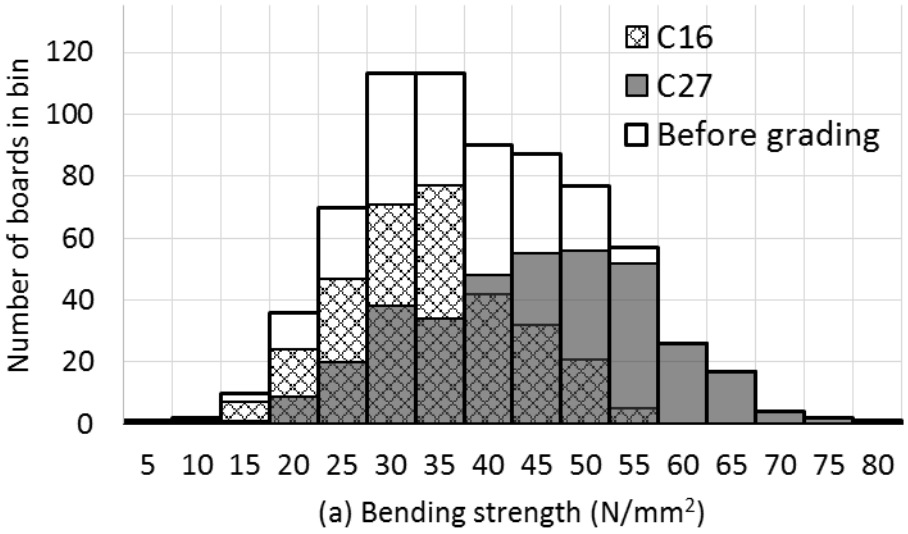


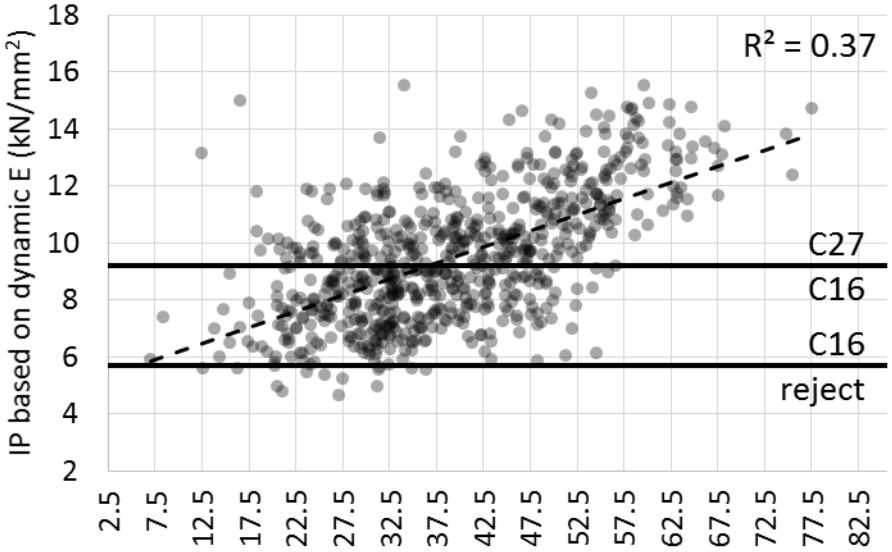
British spruce (WPCS)



UK larch (WLAD)

UK larch with mtgBATCH 962

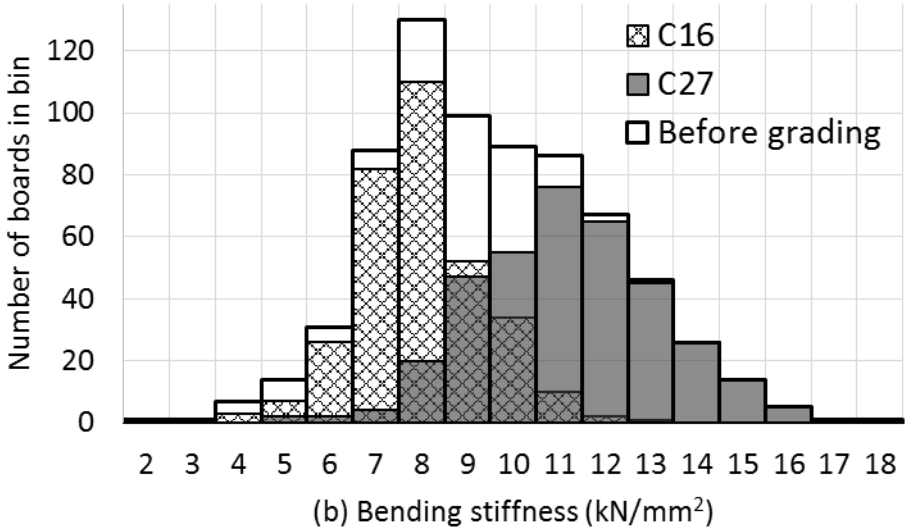


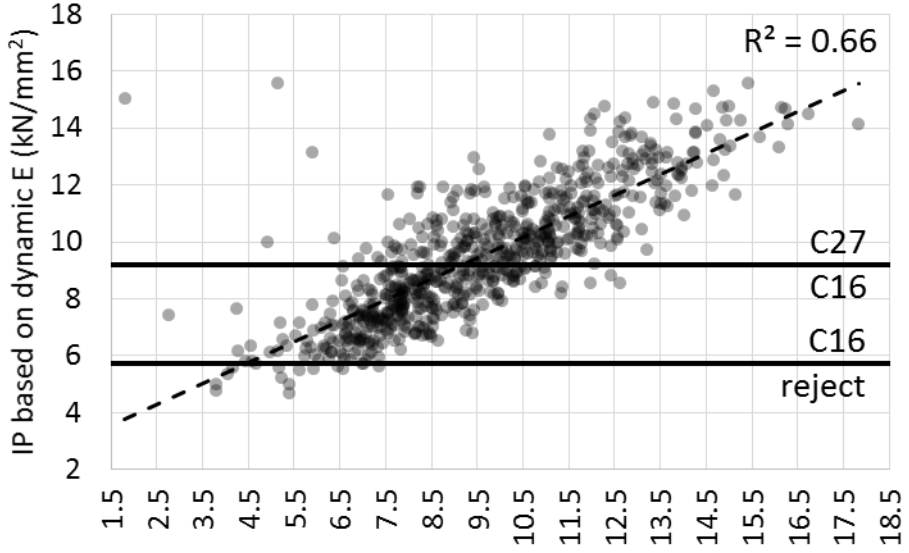


	% of required		
	Bending strength	Bending stiffness	Density
Class	%	%	%
C16	143% ✓	105% ✓	129% ✓
C27	100% ✓	103% ✓	122% ✓

Strength

UK larch with mtgBATCH 962





	% of required		
	Bending strength	Bending stiffness	Density
Class	%	%	%
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Stiffness

UK larch with mtgBATCH 962

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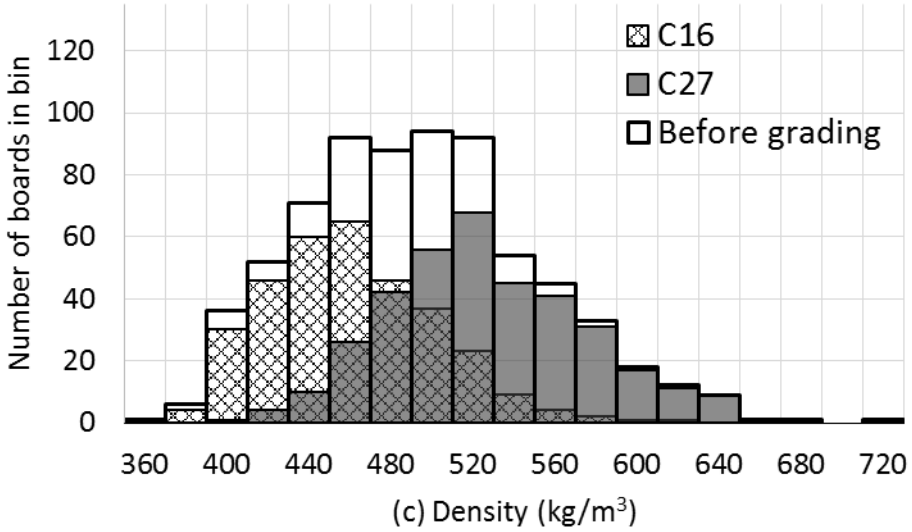

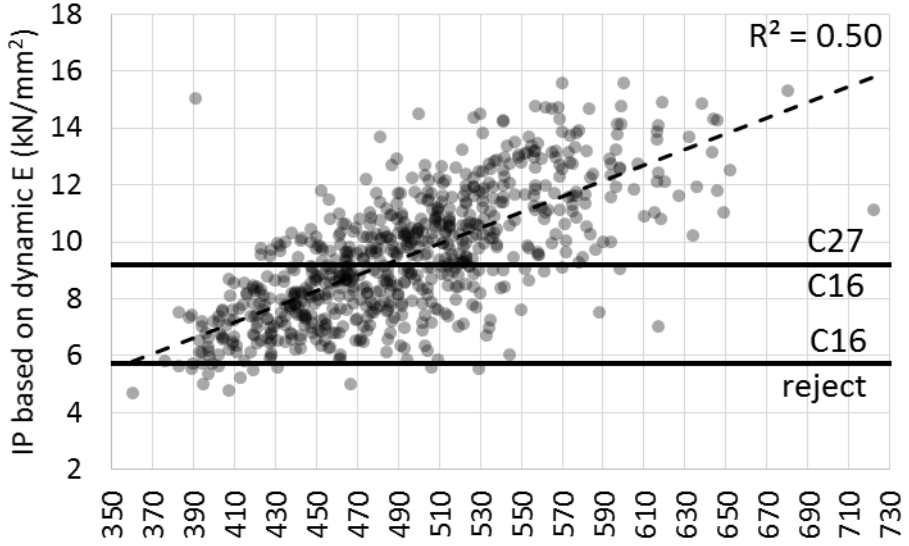

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Density

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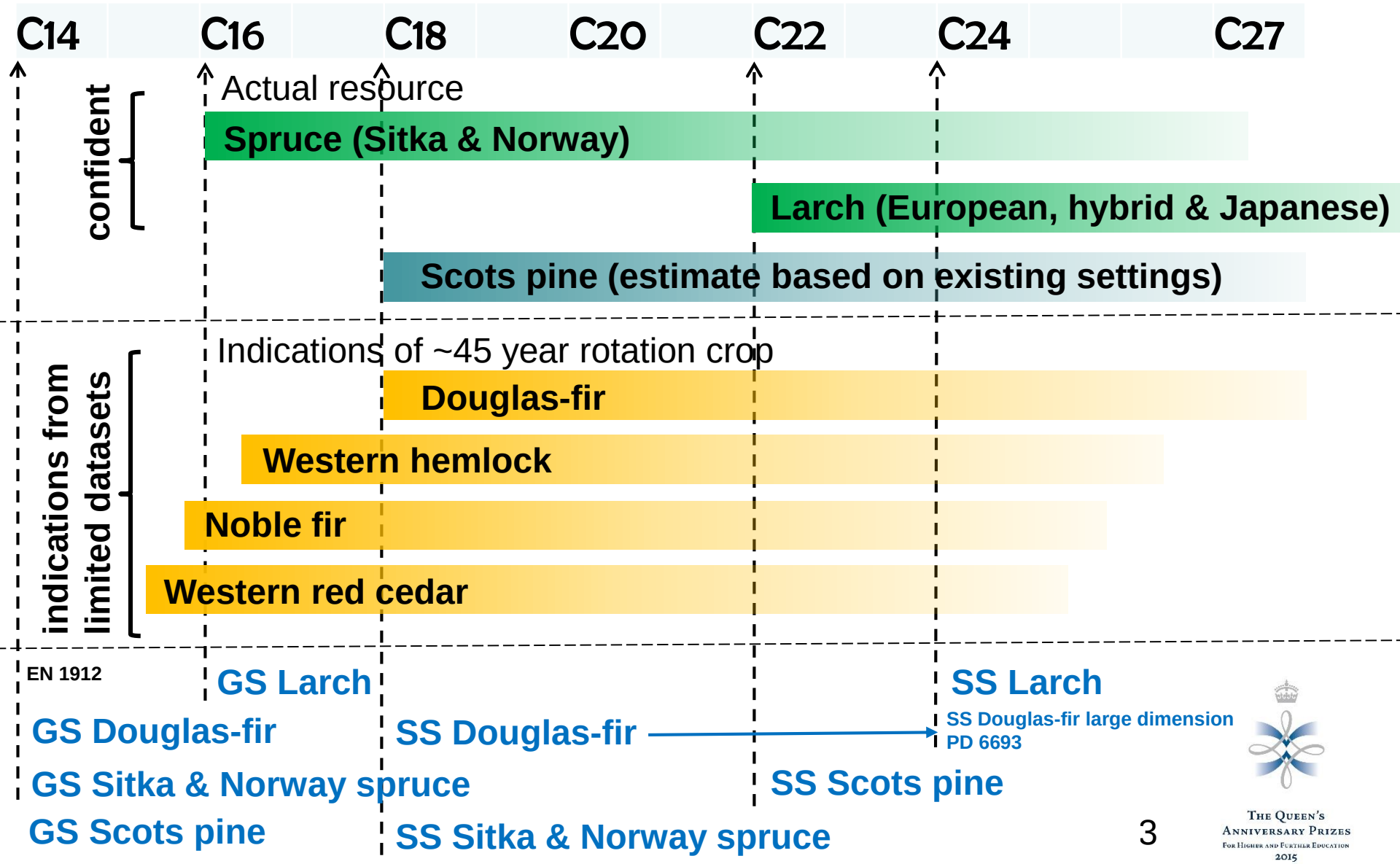
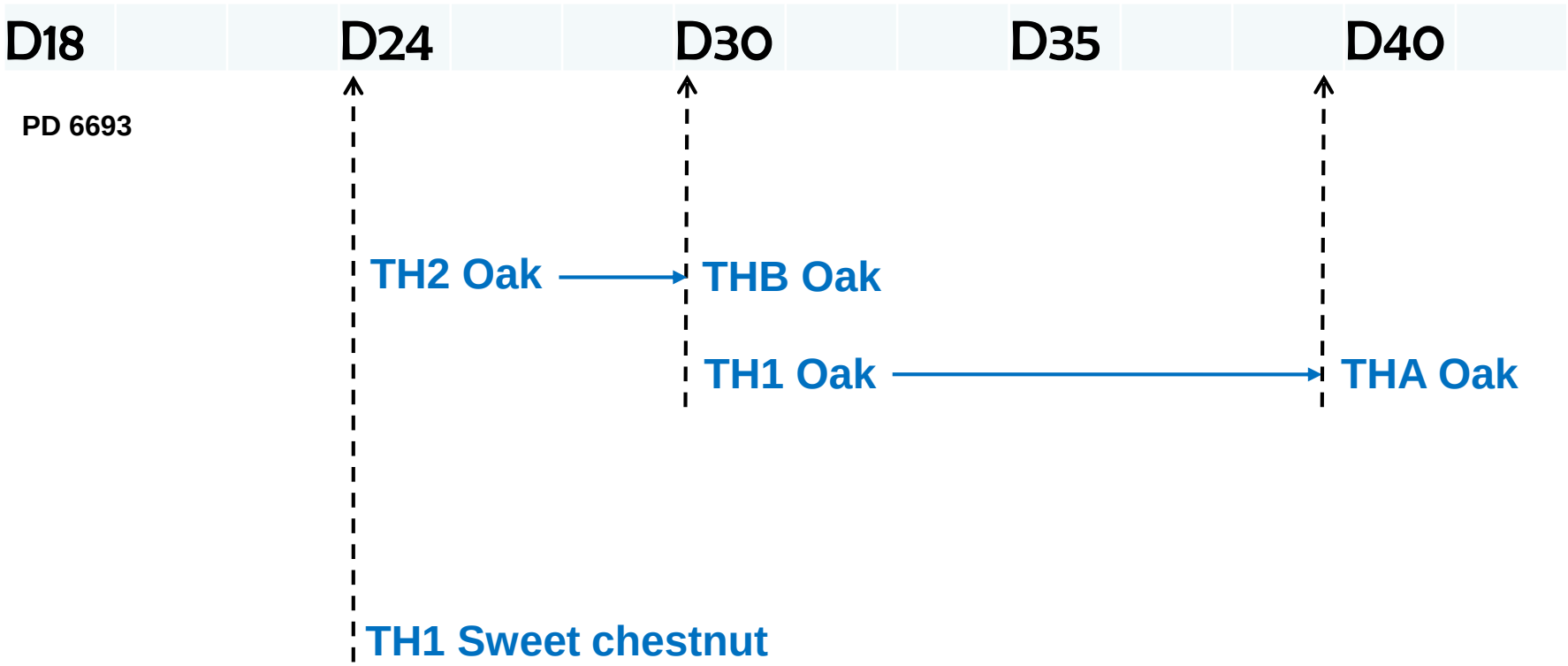
UK-grown timber



UK-grown timber



Summary

- British spruce achieves C16, almost 100% yield
  - Stiffness is the limiting property (not density)
  - Has higher strength and density than C16 requires
  - There is good timber within the resource
- UK larch almost as good as that grown in the Alps
  - But *Phytophthora ramorum* ☹
- We need to gather more information about other species – appears stiffness is commonly limiting
  - Can't rely on small amounts of test data, small clear tests, or data from timber grown elsewhere