



Strategic Integrated Research in Timber

Edinburgh Napier
UNIVERSITY

Assessing timber quality

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RFS Future Foresters Technology Day

1st National Forestry & Arboriculture Student Conference





Image : wood for good

What is wood quality?

- Wood quality depends on the application
- For construction
 - Strength (aka MOR)
 - Stiffness (aka MOE)
 - Density
 - Variation in the above
- Appearance and knots
- Distortion
- Durability
- Sizes
- Ease of processing
- Etc...
- But be aware: It is not all about density!



Density

– not always a good thing

If only we
were a bit
heavier!



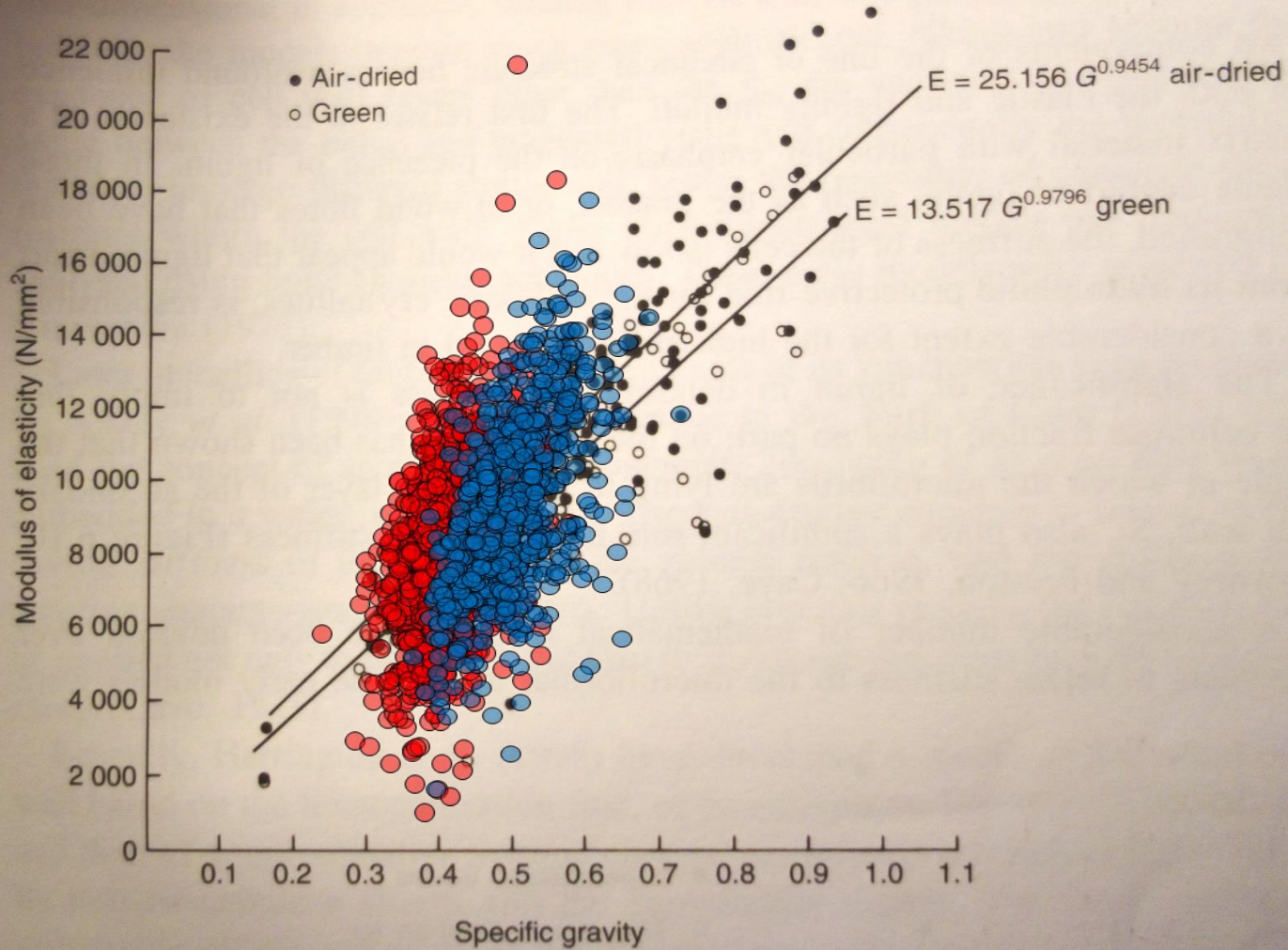
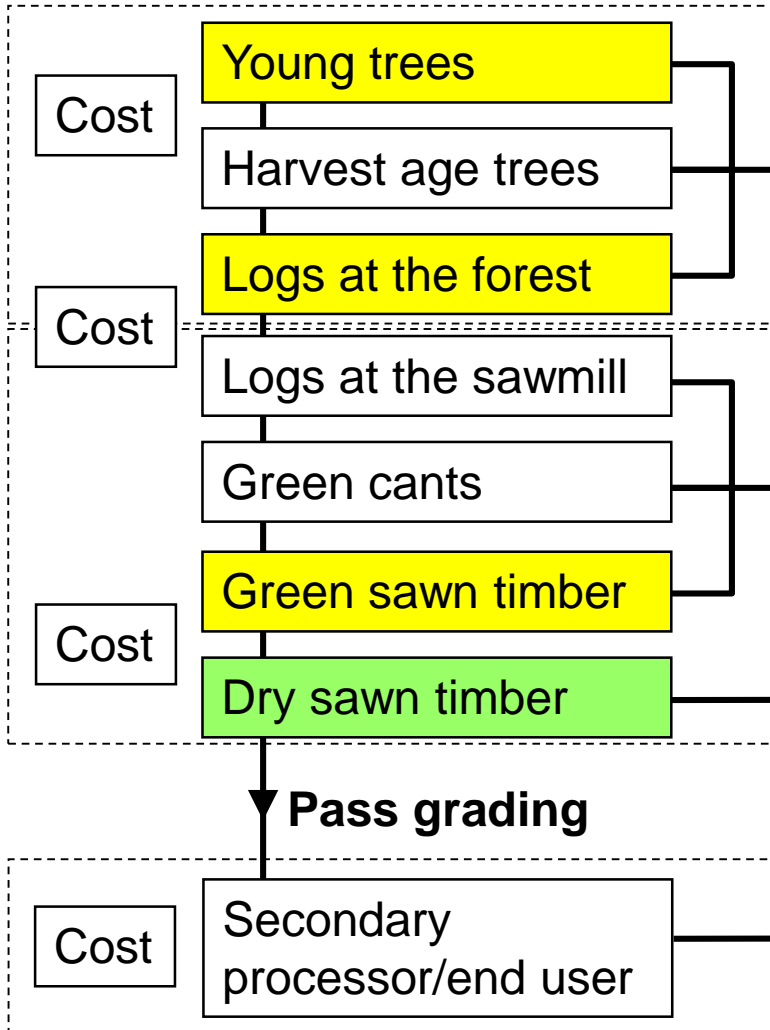


Figure 6.9 Effect of specific gravity on the longitudinal modulus of elasticity for over 200 species of timber tested in the green and dry states (© BRE)

Reducing wastage



Species choice
Effects of tree breeding



Segregation to other markets
Log / stem data
(forest data)

Fail pre-grading
Timber data → predictive of dry
(log / stem data, forest data)

Fail grading **Co-products**
Timber data
(log / stem data, forest data)

Fail quality control **Waste**
Visual assessment?

More cost incurred in processing
Higher penalty for incorrect decision



Simple

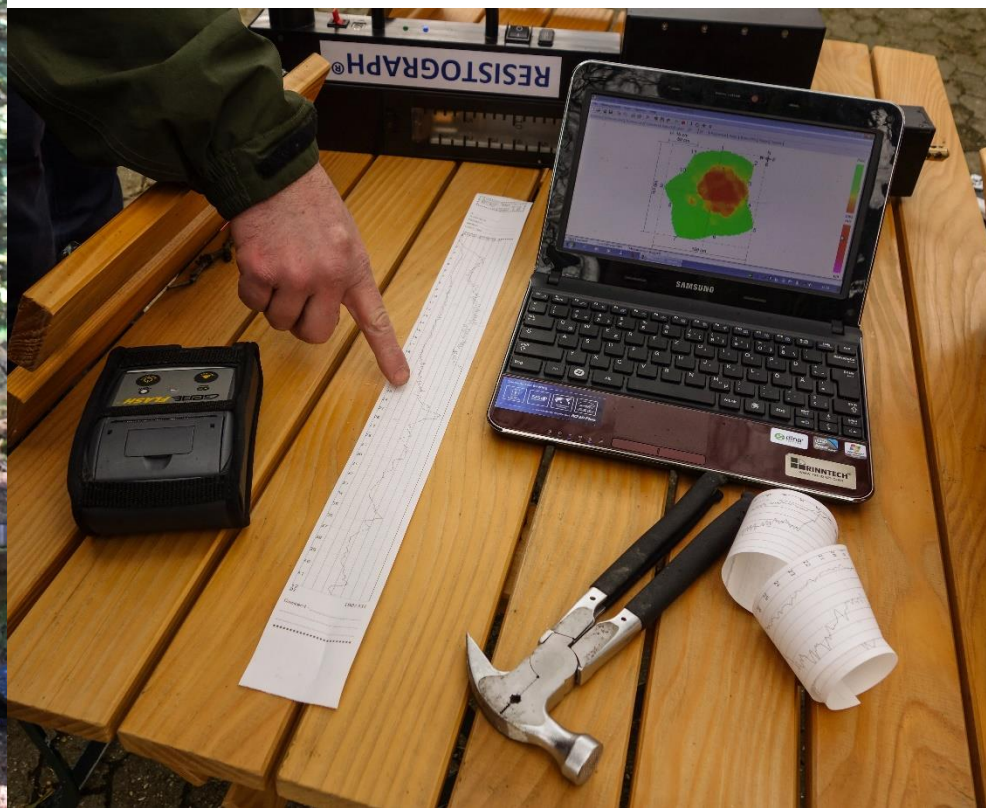
- Site
- Spacing
- Thinning
- Age
- DBH
- Crown ratio
- Slenderness
- Branches

Models for forest growth (yield)
can estimate timber quality
(so long as we have the
underpinning research)



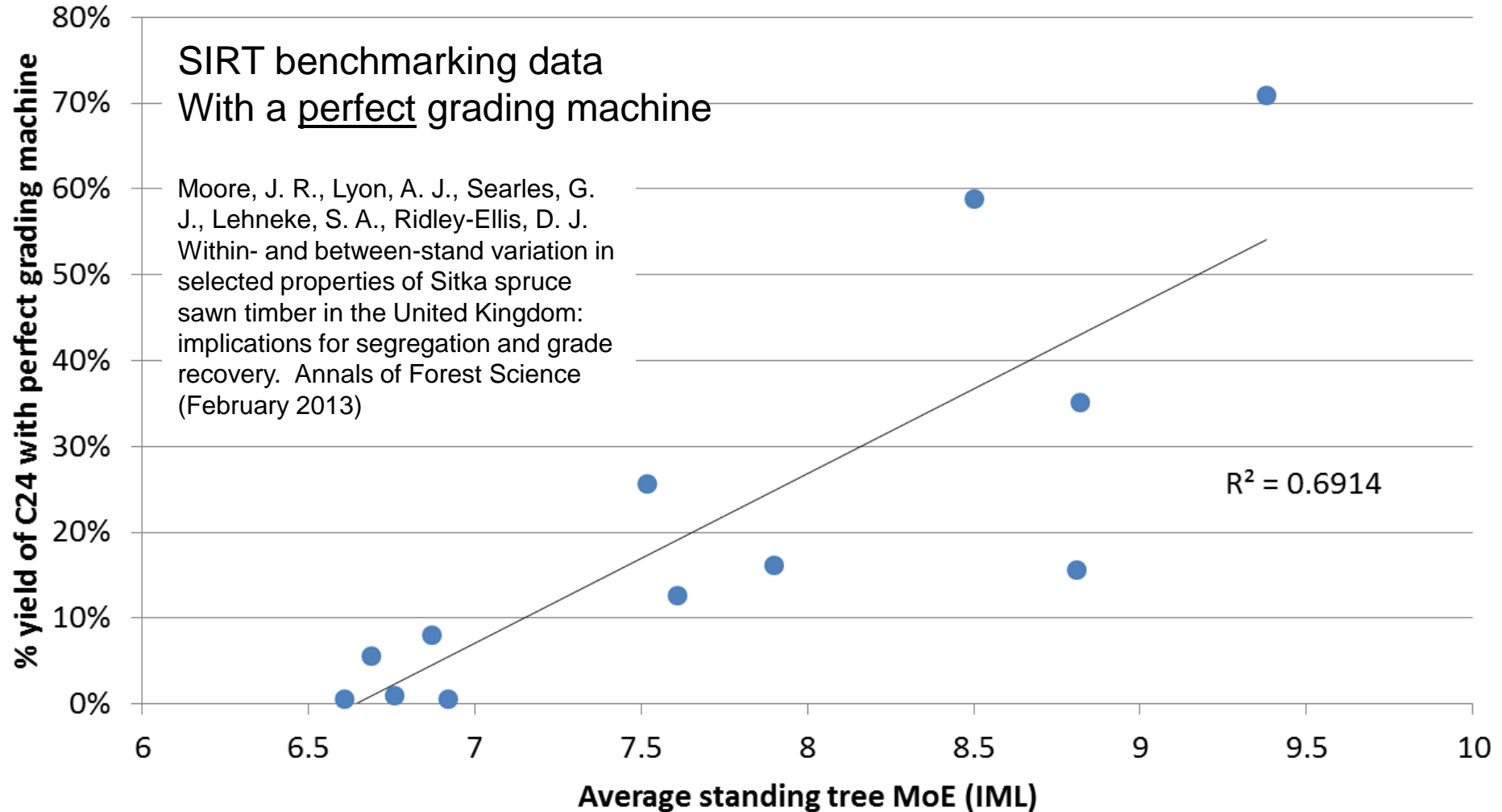


- Increment coring
- Pin penetration
- Resistance drilling
- Acoustics



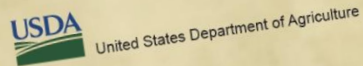


Standing tree acoustics



Felled logs





Proceedings 20th International Nondestructive Testing and Evaluation of Wood Symposium

Madison, Wisconsin USA
2017



Forest Service, Forest Products Laboratory
Forest Products Society
International Union of Forest Research Organizations

General Technical Report
FPL-GTR-246

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Nondestructive Assessment of Wood Quality throughout Wood Supply Chain and Manufacturing Process

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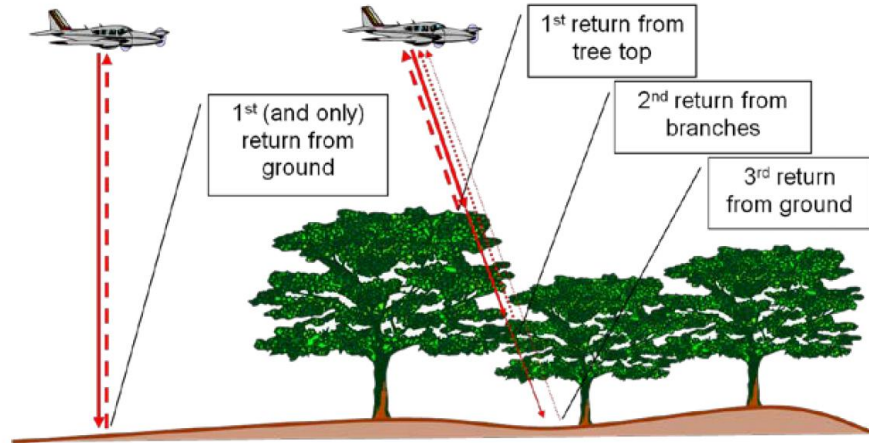


Figure 1—Laser scanning, crown dimensions and branch details can be measured as basis for further image processing (<http://www.wo1.ugent.be/wp-content/uploads/2017/05/lidar-technik.png>)

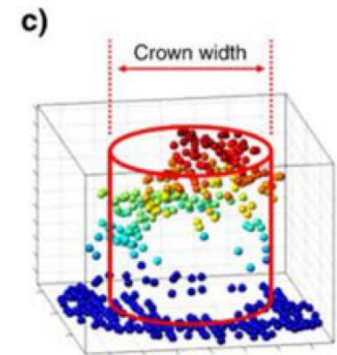
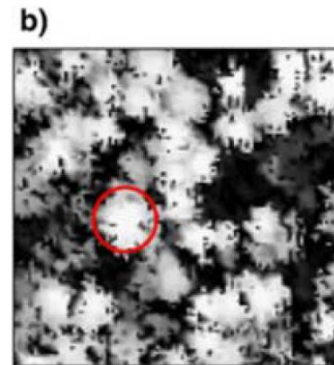
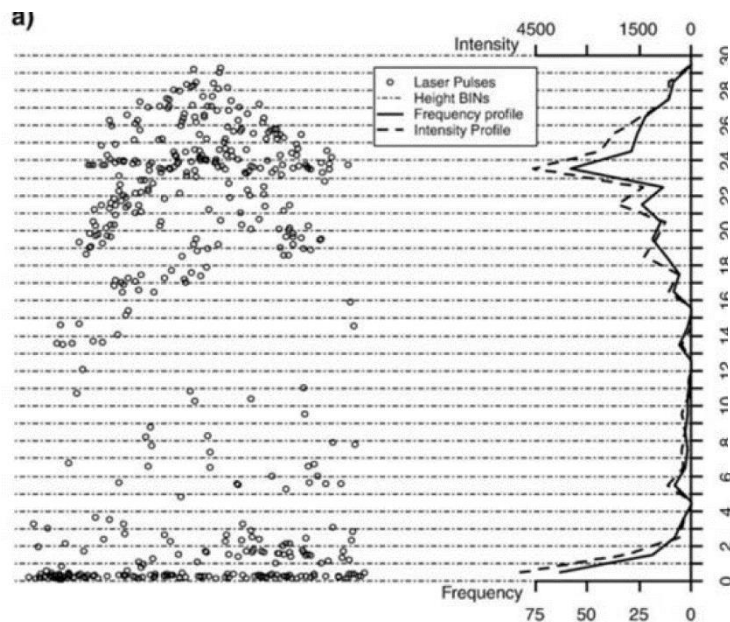


Figure 2—Measuring crown parameters from t-LiDAR method (Popescu et al. 2008)

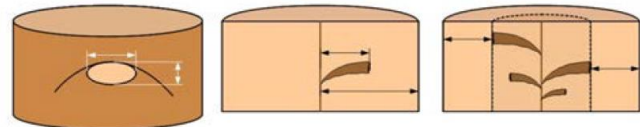
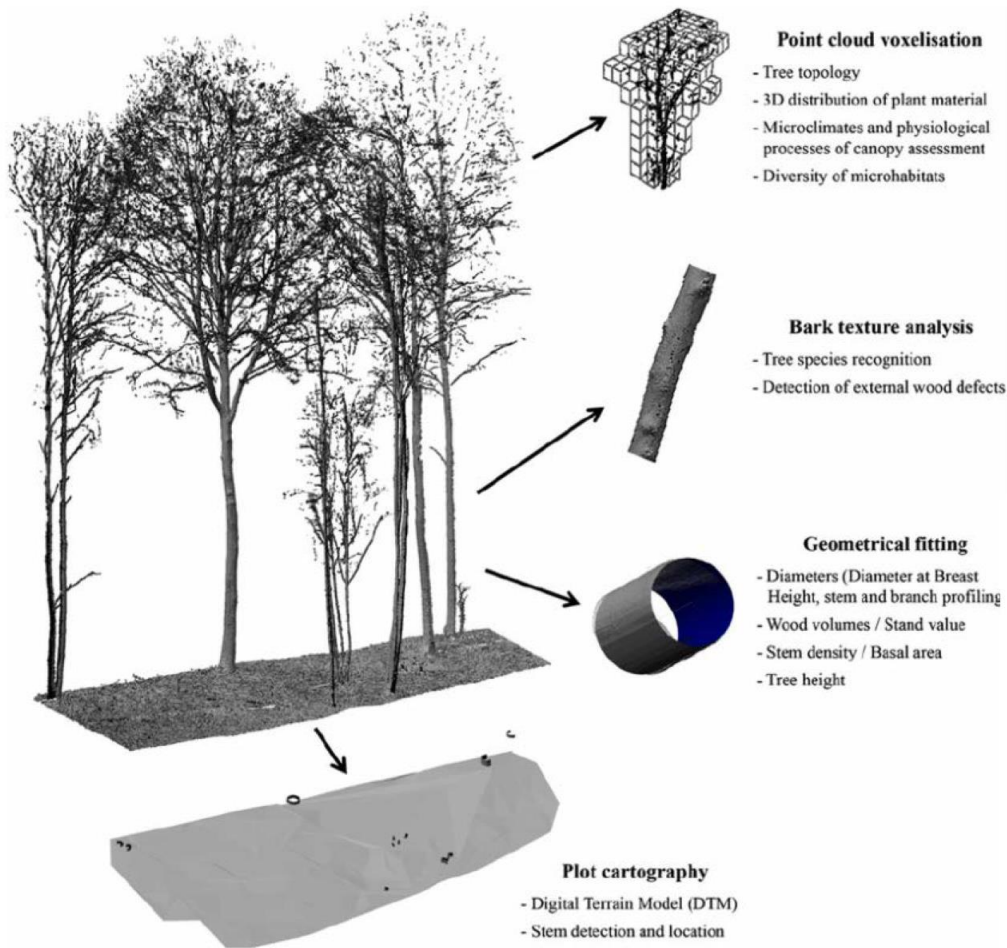


Figure 3—Clear-wood content in standing trees predicted from branch scar measurements with terrestrial LiDAR and verified with X-ray computed tomography (Staengle et al. 2014)

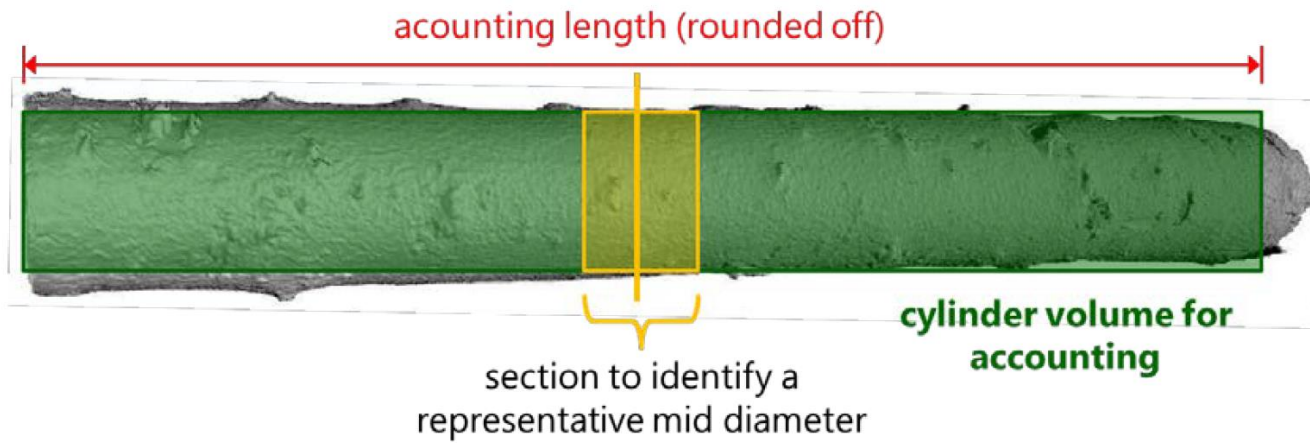


Figure 4— Methods for precise scaling and grading of saw logs using 3D-scanning systems (Sauter and Staudenmaier 2017)

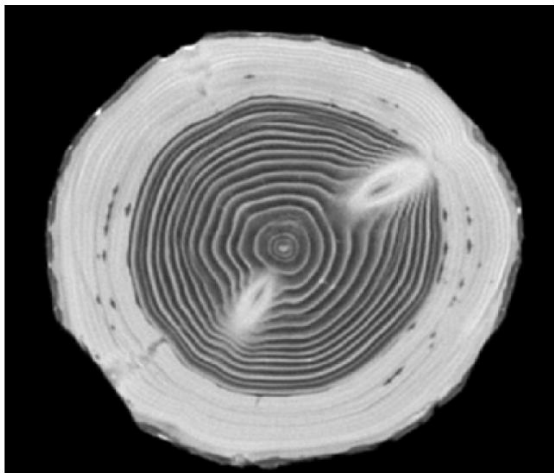


Figure 5—Roundwood sawing optimisation according to X-ray based computed tomography; (Bruechert et al. 2017)

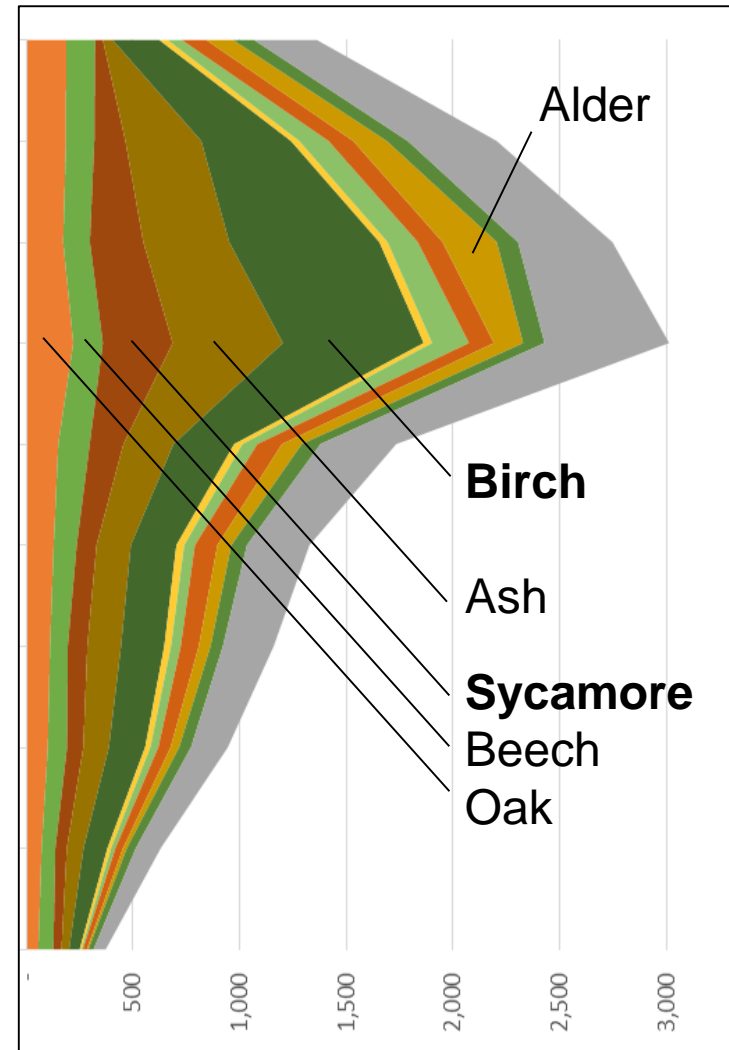
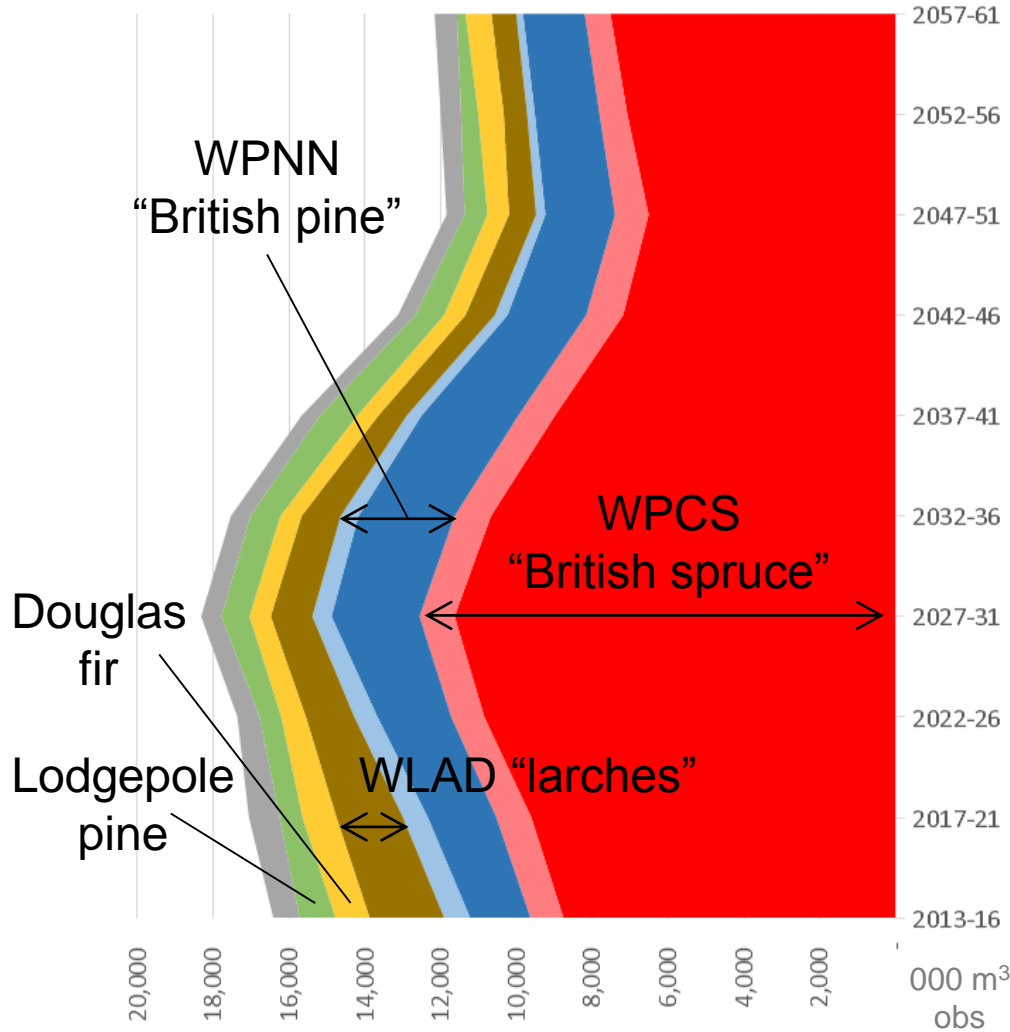
Future forests

- Different species
 - New planting
 - Using more of what we already have
- Familiar species but changed
 - By climate change, pests and diseases
 - By forest management
 - By seed selection and tree breeding
 - Especially now with genomic selection
 - e.g. “Sitka spruced” project <https://www.forestry.gov.uk/fr/sitkaspruced>

We will need ways of dealing with more variety and less information from past experience and extensive testing



GB volume forecast (FC)



New technology in markets

- e.g. Biorefinery
 - Extractives
 - <http://ited.iidi.org.uk/>

The screenshot shows a web browser window with the URL ited.iidi.org.uk/c/search/searchid/103. The page features the ITED logo on the left and a navigation menu with categories: Observations, Taxonomy, and Collections. The main content area displays search results for 'Phenols'.

Search Results (1 items) refine

Search Filters: Species: 1 ✕

Click on a filter to remove it entirely from consideration or use the refine button to add/remove individual species, tree parts, applications or extractives.

Only observations that include entries from ALL displayed search filters are shown below.

species	tree parts	application	extractives	rating	traditional	
Conifer, Abies alba, Larix decidua, Picea abies, Pinus sylvestris	bark		Catechin, Epicatechin, Arabinose, Galacturonic acid, Galactose, Glucose, Mannose, Phenols	Standard		details

Search: [input] new [input] add refine clear

Extractives: grid import



Summary

- Existing & emerging tech allows assessment of wood quality earlier in the chain
- Doesn't need to work tree-by-tree to be useful
- What is “quality” depends on the end use
- It is not all about density!
- And foresters are the ones with most influence on timber quality

