NON-DESTRUCTIVE METHODS OF MEASURING SAWLOGS TO ESTIMATE THE PHYSICAL AND MECHANICAL PROPERTIES OF SAWN TIMBER

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INTRODUCTION AND OBJECTIVES:

In the Czech Republic – sawmill industry is a most important sector of primary processing, but it is relatively **conservative** and **slow developing**. The focus is primarily on processing technologies and less on technologies for sawlog quality grading. As a result, there is still **great potential for log pre-grading** to produce **strength-graded sawn timber**, which is enhanced by **developments in technologies** such as **computed tomography** (Ravoajanahary et al., 2025) or **acoustic methods** (Rais et al., 2020). The **combination of a multiple non-destructive methods** also appears to be an interesting option (Weidenhiller et al., 2023).

In order to improve the quality grading of sawlogs, it is necessary to apply a number of technological and scientific results in practice, with great emphasis being placed on the use of new non-destructive methods. New pre-sorting methods should respect the manufacturing of products with higher added value - strength-graded sawn timber. Based on these principles, this research aims to:

i) **determine the most suitable non-destructive methods for the qualitative grading of sawlogs;**
ii) **define a suitable combination of this non-destructive methods; and**
iii) **create sufficiently accurate models for predicting the mechanical properties of sawn timber.**

Fig. 1: Sawlog measurements

Fig. 2: Cant sawing

Fig. 3: Sawn timber measurements

MATERIALS AND METHODS:

- 60 Norway spruce (*Picea abies* L.) sawlogs
- Manual measurement of wood defects
- Measurement of **acoustic properties of sawlogs**
- CT scanning and cant sawing (3 boards 40/160/3000 mm)
- Measurement of **acoustic properties of sawn timber**:
  a) **Green sawn timber** (whole 3 meters)
  b) **Dry sawn timber** (whole 3 meters)
  c) **Dry sawn timber after trimming** (worst 1.5 meters)
- Image defect analysis and determining of **MOR**, **MOE** and **density** (EN 408)

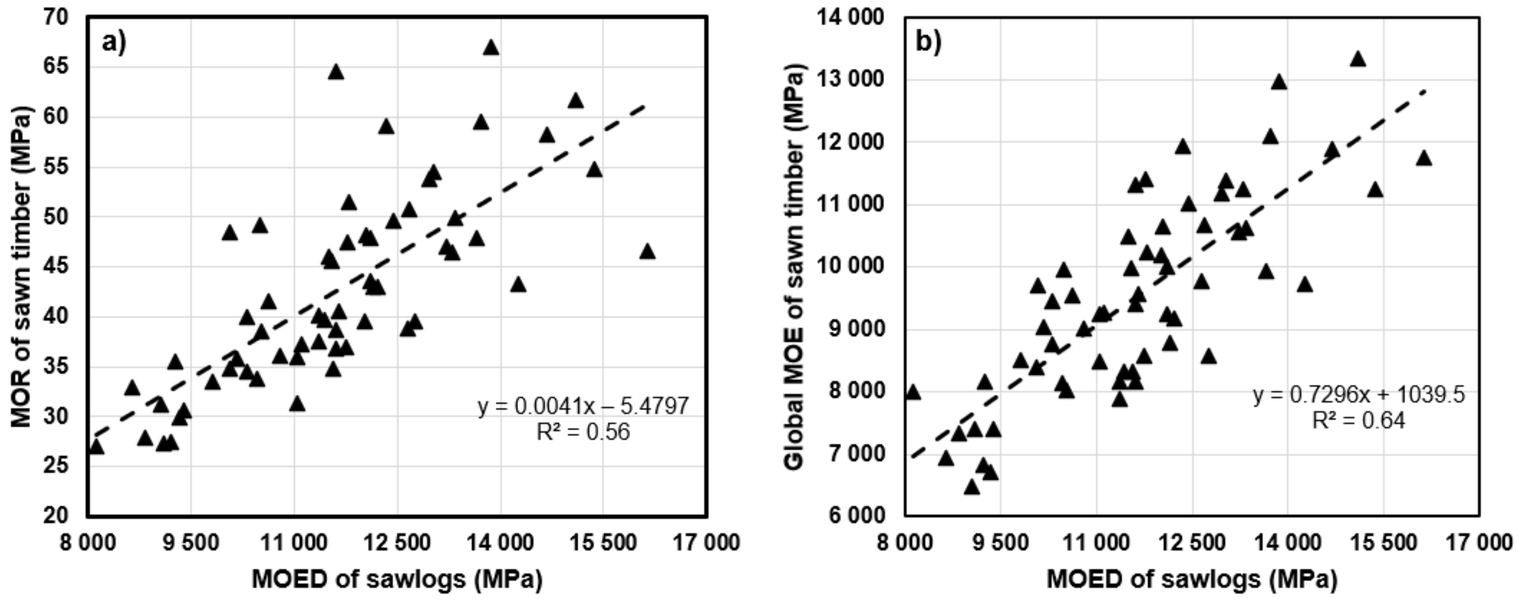

Fig. 4: Relationship between MOED of sawlogs and MOR of sawn timber (a); Relationship between MOED of sawlogs and global MOE of sawn timber (b)

RESULTS AND NEXT STEPS:

- There is a great correlation between **acoustic properties of sawlogs** and **mechanical properties of sawn timber**
- **Manually measured characteristics of sawlogs** are **not a very suitable predictor** of the mechanical properties of sawn timber
- In follow-up research, it is appropriate to **expand the model** with parameters based on the processing of **CT scans of sawlogs**

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