TECHNICAL UNIVERSITY OF ZVOLEN
FACULTY OF FORESTRY
DEPARTMENT OF FOREST HARVESTING, LOGISTICS AND AMELIORATIONS

TECHNICKÁ UNIVERZITA VO ZVOLENE

LESNÍCKA FAKULTA

NEW POSSIBILITIES FOR THE WOOD QUALITATIVE ASSESSMENT IN THE CIRCULAR ECONOMY

doc. Ing. Miloš Gejdoš, PhD.
Ing. Katarína Michajlová

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Current Trends and Challenges for Forest-Based Sector: Carbon Neutrality and Bioeconomy

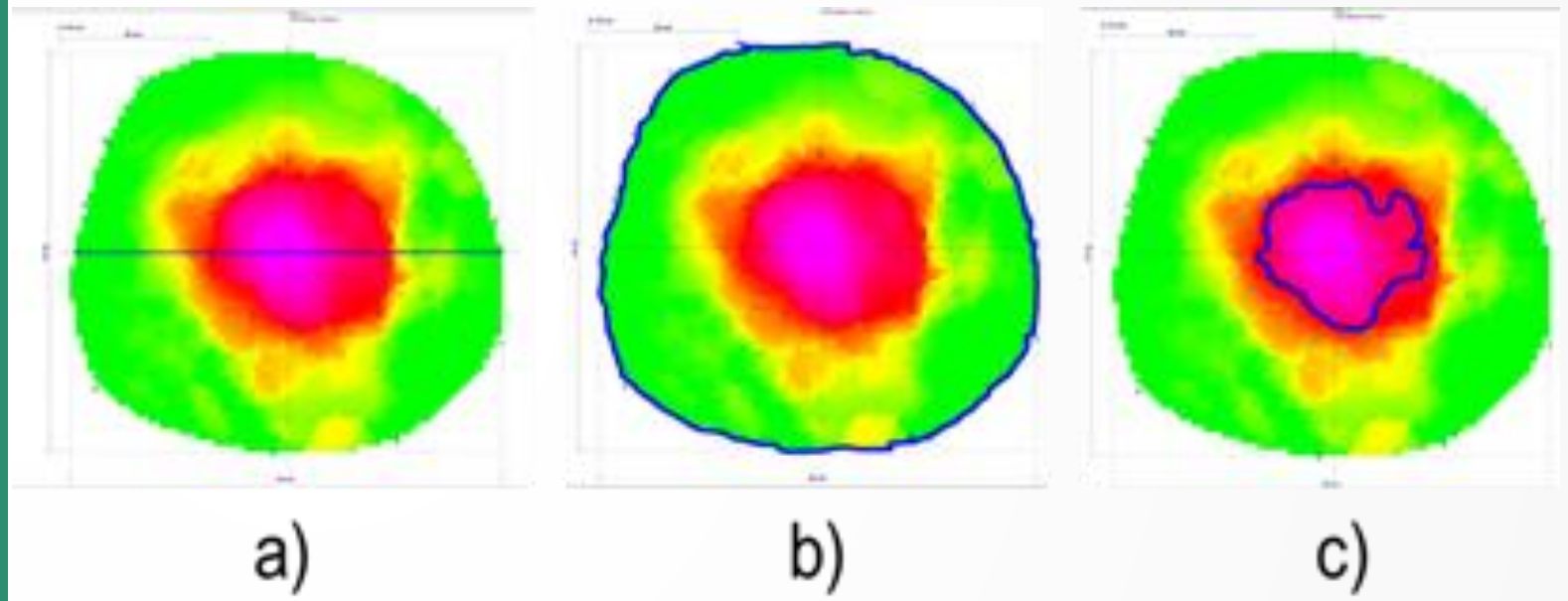
INTRODUCTION

- *The current principles of the market economy and the global energy crisis, caused mainly by the geopolitical situation, have significantly increased the demand for both raw wood and timber products.*
- *We can qualitatively evaluate standing trees in forest stands only with the help of a visual assessment by qualified forestry staff or with the help of tree and stand assortment tables.*
- *The aim of the work was to verify the non-destructive method of qualitative assessment of standing trees using an acoustic tomograph.*
- *At the same time, the goal was to determine the potential of using the detected quality classes in the field of wood processing and reuse from the point of view of circular economy principles.*

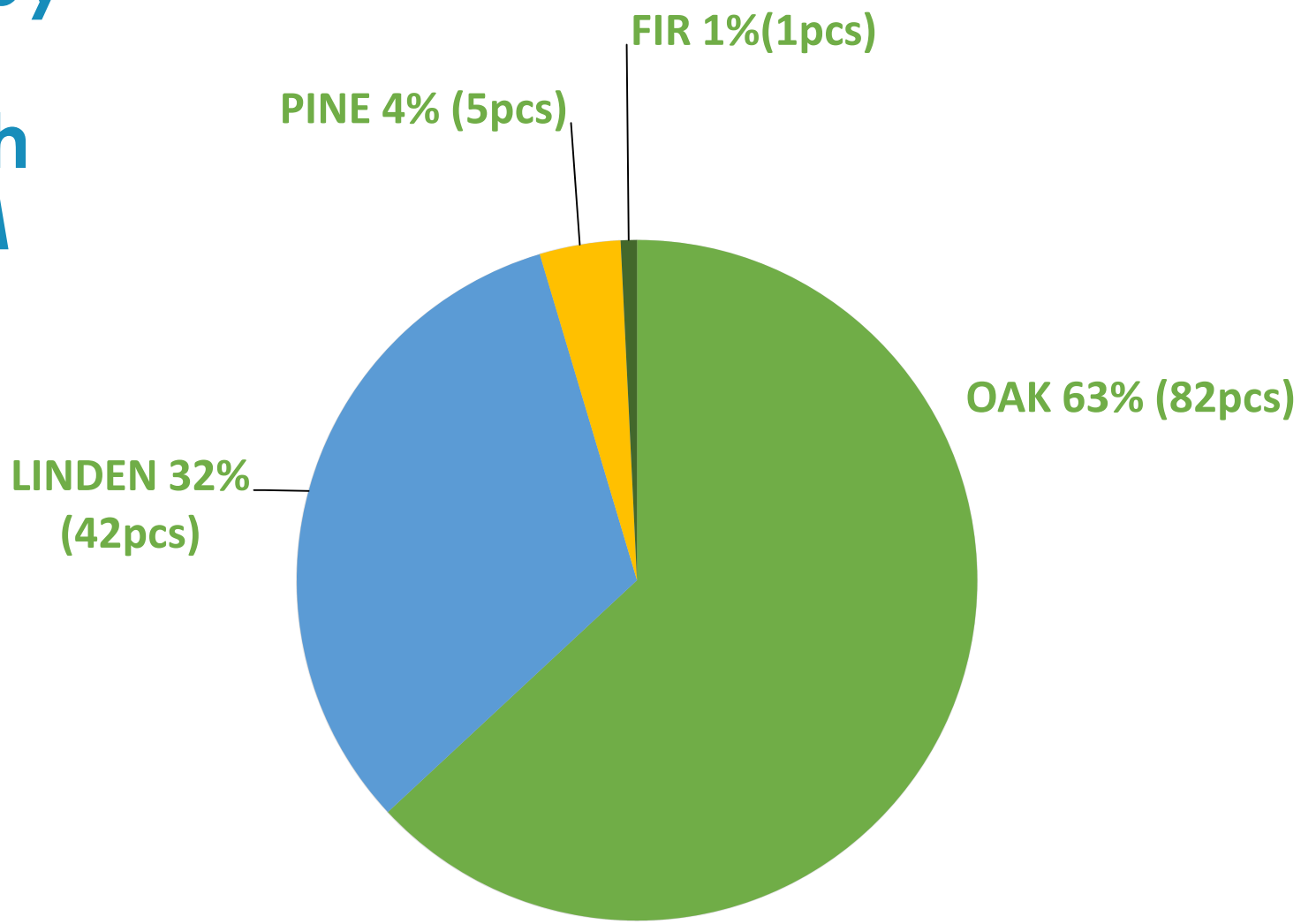
ARBOTOM

- *The ARBOTOM acoustic tomograph with integrated software was used for the qualitative assessment of standing trees.*
- *The Arbotom acoustic tomograph is a new pulse tomograph enabling a real two-dimensional or three-dimensional image.*

Assessment of the trunk quality from image developed by tomograph in software ImageJ

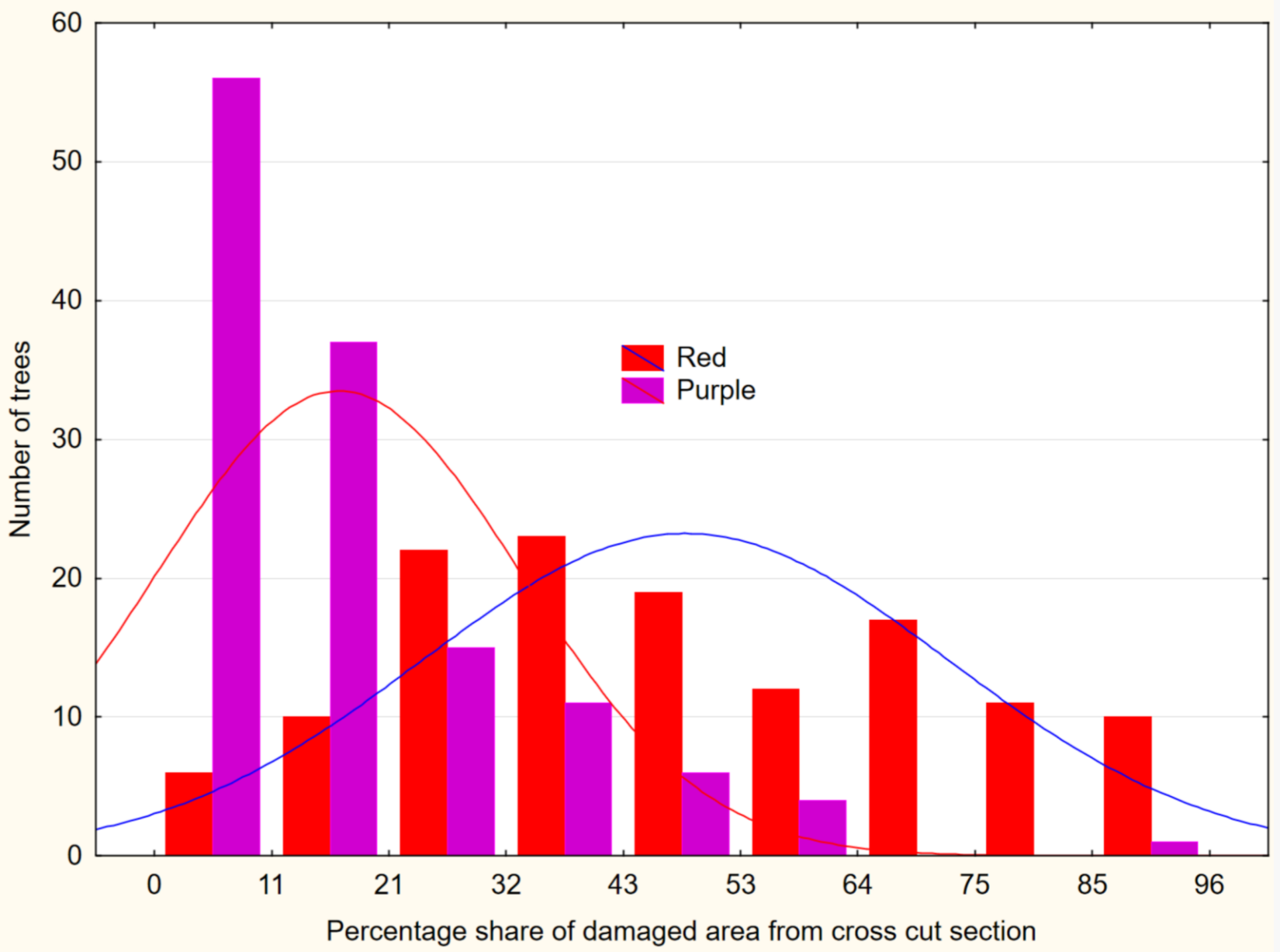


Tree species measured by acoustic tomograph ARBOTOM



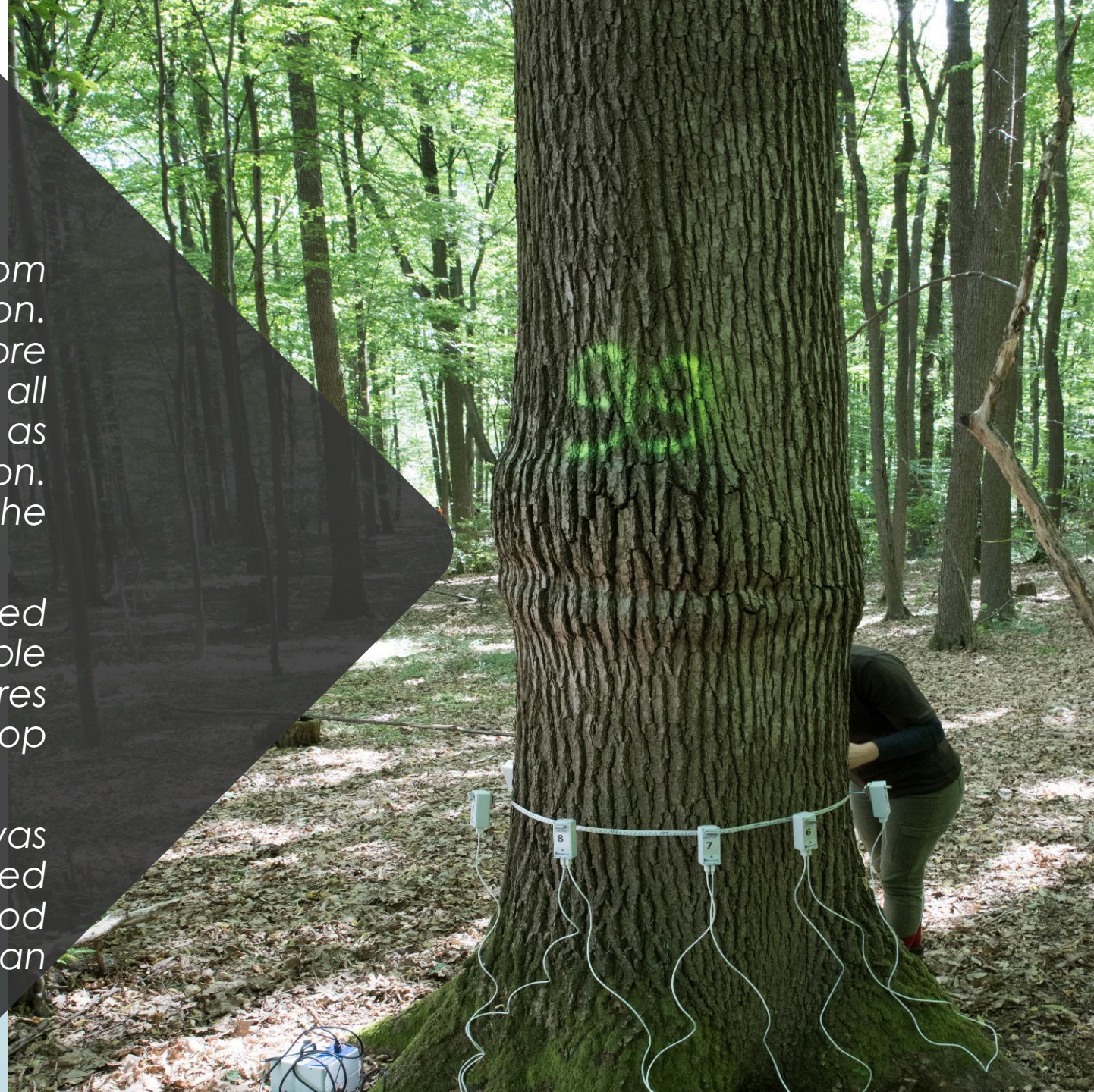
RESULTS

- *The obtained results provide an overview of the qualitative structure in the ground part of the analyzed trunks.*
- *The tomograph software detected four colored zones based on the speed of the acoustic signal.*



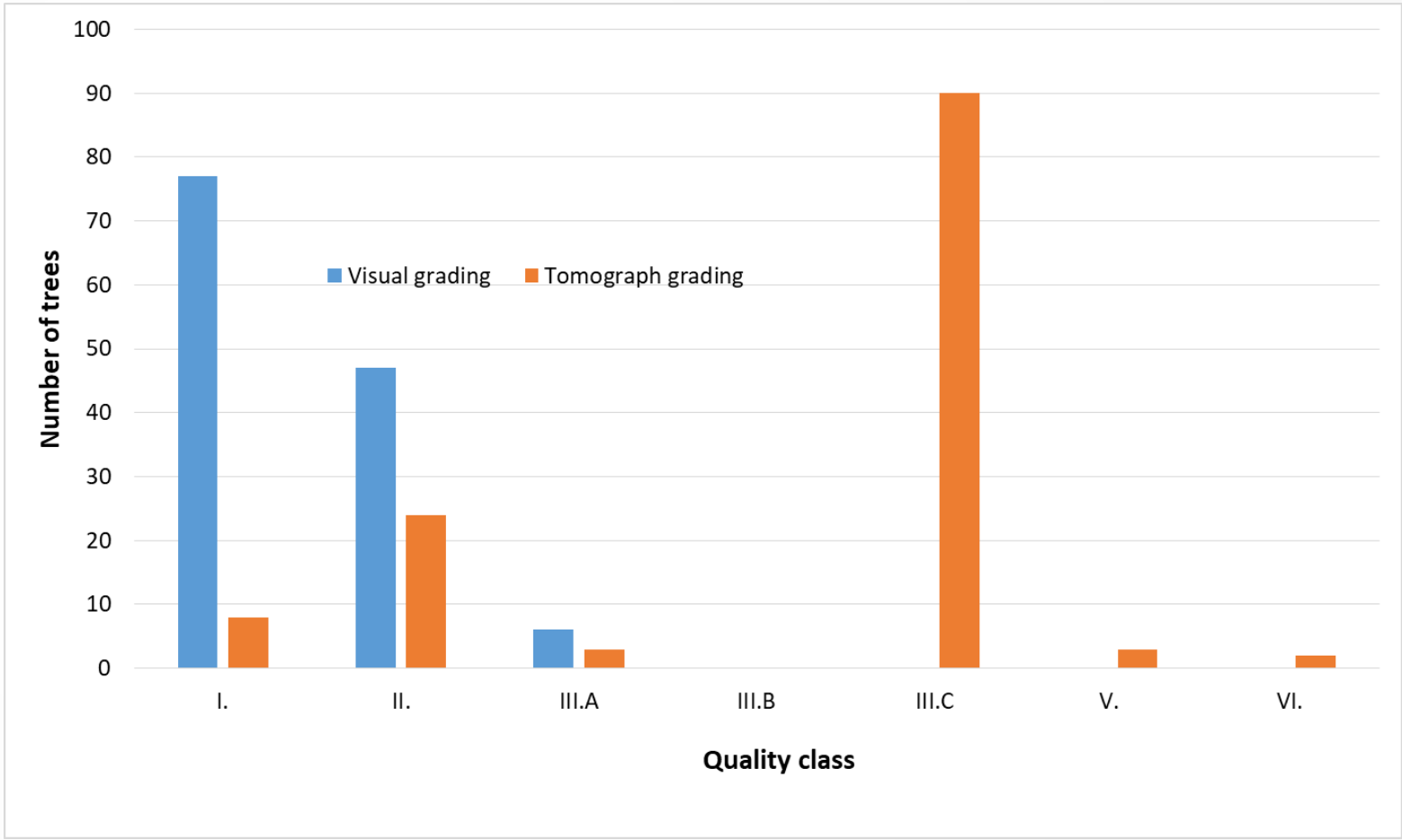
Qualitative classification of ground parts of tree trunks and the potential of use in the circular economy

- *STN standards 48 0055 and 48 0056 from 2007 were used for qualitative classification. Since the qualitative feature of a false core is not considered on the analyzed trees, all zones with a purple color were assessed as rot in the given range of the cross-section. We considered the theoretical length of the assortments to be 4 meters.*
- *The first qualitative sorting was done based on visual assessment based on visible qualitative and quantitative features (middle thickness of the section, top diameter).*
- *The second qualitative sorting was performed based on the identified qualitative feature of rotting or wood damage inside the trunk by means of an acoustic tomograph.*



Number of trees in quality classes according to Slovakian standards based on visual assessment and assessment with acoustic tomograph

- *The evaluation shows that in the qualitative classification of standing trees, only on the basis of their visible features and quantitative features, the classification into quality classes is considerably overestimated.*
- *When detecting potential damage by rot using a tomograph, there is an obvious qualitative shift, where there are relatively strict restrictions on the occurrence of rot in oak wood.*
- *When applying this classification, almost 70% of all trunks were classified in quality class III.C. Due to the large extent of damage, conifers were only classified in the classes of fuel wood and pulpwood.*



Number and quality classes of assortments that are potentially reusable

- *From the point of view of reuse and recycling of wood products that can be made from the given assortments, the assortments classified in quality classes I. and II., or III.A, have the highest potential for reuse. To a certain extent, it is possible to consider recirculated use even for assortments from quality class III.C.*

Assortment	Number of trunks	
	First grading	Second grading (based on Acoustic tomograph
I.	77	8
II.	47	24
III.A	6	3

CONCLUSION

- *Non-destructive methods of assessing the qualitative state with a possible combination of laser ground scanning, with precisely determined algorithms of qualitative assessment, are a great promise for the objectification of this process in the future.*
- *With a more accurate qualitative assessment already in standing stands, it is possible to more accurately plan the management of sales and possible wood processing.*
- *In perspective, it is also possible to calculate the volume of wood that will be available for reuse through recycling processes under the principles of the circular economy after the end of the life of the wood products.*
- *However, this process will require not only the improvement of computerization and the deployment of technologies in forestry operations but also the sharing of information and the planning of a common strategy within the forestry-timber complex with an orientation to bioeconomy and sustainable management of forest stands.*

THANKS FOR PAYING ATTENTION!

Authors address:
doc. Ing. Miloš Gejdoš, PhD.; Ing. Katarína Michajlová
Department of Forest Harvesting, Logistics and Ameliorations, Forestry Faculty, Technical University in Zvolen, Zvolen, Slovakia
E-mail: **gejdos@tuzvo.sk**