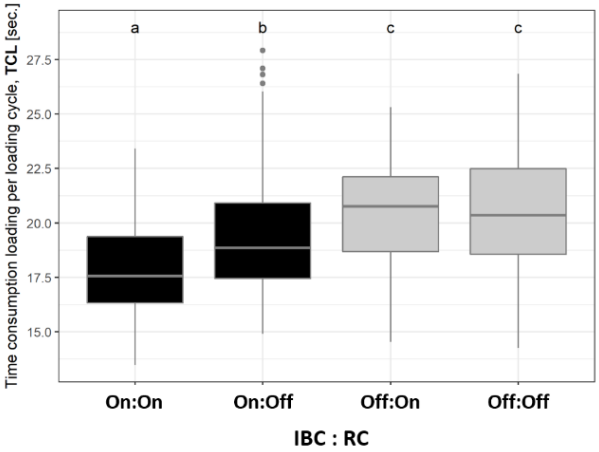
Stakeholder-oriented article

Operator assistance systems and their suitability for improving efficiency of highly mechanized timber harvesting systems

Central European forests are currently deeply affected by large-scale calamities due to wind throw, draught and bark beetle infestations. Due to work safety and productivity, harvesters and forwarders are commonly used to process and forward in the damaged stands. However, the operation of such machines requires lengthy training. The cognitive demands on forest machine operators are enormous. To reduce mental strain of forest machine operators and increase productivity, forest machine manufacturers have implemented operator assistance systems such as intelligent crane controls or rotating cabins to market maturity.



Within the AVATAR project, the effect of rotating cabins (RC) and intelligent crane controls (IBC, John Deere) on loading efficiency of forwarders was analyzed in a pilot study. In various loading scenarios, it was found that the use of intelligent crane controls and rotating cabins together produce synergy effects and can significantly reduce the duration of the forwarder loading process by up to 14%. Furthermore, it was found that the use of intelligent crane control widens productive loading areas of the forwarder - despite greater loading distance and unfavorable loading angles, the forwarder operator needs the same time for loading compared to the favorable loading areas of the reference variant without driver assistance.

The graph shows the time required for forwarder loading cycles for four different variants (n=150 each). Results revealed that the use of rotating cabin alone compared to the reference setting (right plot, both operator assistance deactivated, Off:Off) does not significantly reduce the time consumption per loading cycle (2nd plot from right, Off:On). However, IBC (2nd plot from left, On:Off), especially in combination with rotating cabin (left plot, On:On), significantly reduces the time needed for loading.

Overall, it is very likely that operator assistance will be commonly used in the near future. Based on the results, these assistance features are recommended to become part of the basic configuration of any purchased new forest machinery. Even a change in forest management in Central Europe towards more diverse and mixed stands with different age classes and tree species will not displace highly mechanized timber harvesting systems from the market. Therefore, moderate additional costs of the tested assistance systems are quickly amortized. The use of these systems can furthermore contribute to a less demanding work environment for operators and, as such, contributes to a sustainable and competitive bioeconomy in Europe.

Project Title
Advanced Virtual Aptitude and Training Application in Real Time **(AVATAR)**

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This research was funded within the framework of the EU-project AVATAR under the umbrella of ERA-NET Cofound ForestValue by Fachagentur Nachwachsende Rohstoffe e.V. (FNR). ForestValue has received funding from the European Union´s Horizon 2020 research and innovation programme under grant agreement No. 773324.

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