Transilvania University of Brasov

HABILITATION THESIS

SUMMARY

Title: Wood quality, damage level, work productivity and the measurement of wood assortments in timber harvesting

Domain: Forestry

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This thesis presents the author's scientific accomplishments during the postdoctoral period. The Introduction (Chapter 1) displays the author's main research directions in the larger context of post 1990 forestry evolution. Chapters 2,3,4 and 5 describe the author's research with regard to activities characteristic of timber harvesting. Thus, the impact of frost-crack on beech wood quality is discussed in chapter 2, knowing the fact that wood quality evaluation based on exterior defects is an important activity in wood valuing as well as in wood sorting.

Frost crack represents one of the main defects which affect European beech wood quality. The purpose of this research is to improve the knowledge regarding both the impact of frost crack on European beech wood quality and the frost crack characteristics which affect wood quality. The defects which accompany frost crack have also been identified. Moreover, the possibility of determining these defects using the IML RESIF500 – S Resistograph has been tested. The research has emphasized the existence of statistical correlations between frost crack star-shaped heart expansion, frost crack rib prominence and frost crack length. The presence of defects which affect wood structure leading to a decrease in penetration resistance can be determined accurately with the resistograph. The measurements made on the frost cracks studied have been gathered in a graph which shows frost crack impact on European beech wood quality.

Chapter 3 looks at the ecological impact of timber harvesting on forests – The research was aimed at determining the amount of damage to trees, identifying the damage types, their frequency, extent, form and distribution at the level of trees and at the level of the entire stand. The research was conducted in a spruce stand with disseminated beech and larch trees from the Carpathian Mountains, where thinning operations had taken place. The CTL (Cut-To-Length) system was applied by using harvester and forwarder. Thus, 7.5 % of remaining trees were damaged with the amount of damage depending on the following factors: species, initial density of the stand, harvesting intensity, slope trail, terrain configuration, mechanzation level and work organization. Moderate damage prevailed, the damaged trees presenting: bark removal 50%, gouged wounds 43%, and bark abrasion 7%. Most of the damage (65%) was situated at a height below 1 meter, 67% of these being located on trees situated at a distance of 4 meters at most, from the harvesting-forwarding trails centerline.

Chapter 4 tackles the problem of time consumption, productivity and work performance in coniferous wood harvesting.

The purpose of this research is to establish time consumption and productivity when using Husqvarna 365 chainsaw for resinous tree felling and primary processing (delimbing and cross-cutting) in mountainous regions. The research was conducted in the Romanian Southern Carpathians, in mixed spruce (Picea abies L. Karst.) and fir (Abies alba Mill.) tree stands. Only one team of workers, made up of a feller and an assistant was used. The felling operation was

divided into nine specific stages for which work times were measured. Work time structure used here includes WP - workplace time (PW - productive work time; SW - supportive work time, NT - non-work time) and NW - non-workplace time. The results indicated a productivity of 10.138 $m^3 \cdot h^{-1}$ (4.55 tree$\cdot h^{-1}$) in stand1 and of 11.374 $m^3 \cdot h^{-1}$ (4.33 tree$\cdot h^{-1}$) in stand 2. Productivity is influenced by dbh, stump diameter and the distance between trees. In the case of primary processing, the results indicated a total time of 536.32 $s \cdot m^{-3}$ (1145.26 s$\cdot$tree^{-1}), work performance (including delays) of 6.716 $m^3 \cdot h^{-1}$ (3.14 tree$\cdot h^{-1}$), and work productivity (without delays) of 35.459 $m^3 \cdot h^{-1}$ (16.58 tree$\cdot h^{-1}$). The chainsaw productivity during tree cross-cutting was 82.29 $cm^2 \cdot s^{-1}$. Delimbing accounted for 96.18% of the real work time, while cross-cutting accounted for 3.82%. The time consumption for delimbing and cross-cutting, as well as the work productivity and performance in the primary processing of coniferous trees in the felling area, were influenced by the breast height diameter, stem length, and tree volume, while the chainsaw productivity was influenced by the diameter of the cross-cut sections. The relationships between the aforementioned dependent and independent variables were determined by simple and linear multiple regression equations.

Chapter 5 deals with the measurement of stacked wood and presents the author's research concering the determination of the conversion factor of stacked to solid content, of specific wood mass, mass loss during the stacking period and the measurement of wood moisture content for spruce, beech, hornbeam and oak trees in pulpwood and firewood assortments with the length of 2 and 3 meters. The conversion factors have been determined by using the xylometric, diagonal and surface method. Moisture content and specific mass have been determined by using the samples extracted from freshly felled wood. Mass loss over a period of three months has been determined in stacked wood. This part presents the methods used for the measurement of wood moisture content, wood moisture content variation as compared to log ends as well as the way to build a log sample representative of a wood stack as far as wood moisture content is concerned.

The final part of this thesis represents the development plan of the auhtor's academic career (in research, teaching and cooperation with the economic environment). The thesis ends with a list of references mentioned throughout it.