



New methodology for Douglas-fir timber qualification

Introduction

Douglas fir has a medium texture with pronounced heartwood and a yellowish/red colour.

Its physico-mechanical properties can vary considerably depending on origin, altitude, silviculture treatments, stand age and growth rate, and the wood characteristics can also be influenced by the different Douglas-fir varieties used in plantations.

The aim of the work was to fit into the forest wood supply chain by creating conditions for more profitable use of Douglas fir wood. This can be achieved, for example, by increasing the value of production through more careful wood qualification and diversification of possible uses. The National Research Council's Institute of Bio-Economics based in Florence (Italy) has identified alternative and profitable uses for Douglas fir wood, such as in construction, by defining its technological characteristics and grading methods best suited for its economic and commercial valorisation.

The Do.Na.To project tested a rapid method for analysing Douglas fir roundwood in order to classify its timber for structural uses and define the necessary technological characteristics and grading methods. For the study, 158 logs from trees felled in the Vallombrosa forest complex were marked. The characterization was non-destructive and carried out with the Hitman HM200 instrument from the company Fibre-gen. This instrument, designed for qualitative assessment of roundwood, measures the speed of a mechanical wave generated by percussion, which propagates longitudinally; higher speeds correspond to higher physical-mechanical quality. During on-site measurements, moisture was also measured with an electric wood hygrometer, as it correlated with speed. Based on the speed values, it was possible to separate better quality logs intended for structural sawing from lower quality logs.

The better quality logs were then divided into assortments of various sizes (beams, squares, boards and planks) and then characterized with ViSCAN, a non-destructive tool used for grading timber for structural uses. Since the parameters thus obtained on logs and sawn timber correlated well, the qualification of the roundwood was predictive of the quality of the sawn timber obtained.

Finally, to assess the structural quality of the sawn timber, a ViSCAN-portable simulation was performed to grade the strength of each element. Timber qualification from roundwood to sawn timber permits to find the more profitable use for each Douglas-fir log, while the properties of the Douglas fir timber make it suitable for various uses. It can be used for the production of plywood panels, of beams (worked in fours wires, Uso

Fiume or Uso Trieste), while sawn timber of lesser thickness is used in carpentry (fixtures, furnishings, beads), for packaging production, and also for the production of glued structural products, such as laminated beams and board panels (CLT - Cross Laminated Timber). Innovation activities consisted of transferring experience gained in instrumental applications aimed at assessing the quality of Douglas-fir roundwood and sawn timber produced from it.

Lessons learned

The aim of the work was to unite the forest-wood chain and create the conditions for a more profitable use of Douglas fir, as had been learned from exchanges with other European countries. This could be achieved by increasing the value of production through more careful qualification of the wood and diversification of possible destinations. The cost of the equipment is high and therefore only accessible to industries with a high turnover, but the qualification of the wood, from roundwood to sawn timber, can allow a more efficient and therefore more profitable use. In addition to the critical points, the Tuscan wood supply chain also has some strengths that must be exploited in order to succeed in creating a local Douglas fir supply chain that enhances the different assortments. Firstly, the availability of the local wood resource and the territorial "vocation"; secondly, the changing scenarios of the global wood market and the attention given to the issues of carbon footprint reduction in all economic sectors, which have led to a significant upward variation in the prices of roundwood and semi-finished products, making local products economically competitive; then, the research/innovation/transfer experience carried out in the region; and finally, the very active local industrial sectors that have focused on Douglas fir to characterise their production and diversify their products.

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Further information

<https://www.progettodonato.it/>



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