Productivity and life cycle assessment (LCA) of tree felling by chainsaw in thinning of Calabrian Pine stands

Bruno Bernardi, Giorgio Macrì, Giacomo Falcone

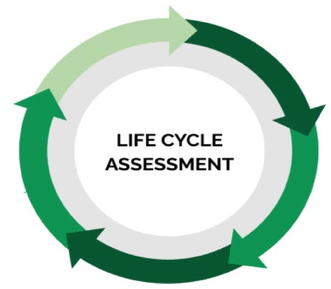
Università Mediterranea di Reggio Calabria, Dipartimento di Agraria, Feo di Vito, 89122- Reggio Calabria, Italy

INTRODUCTION

Chainsaw is the most widely common tool used for tree felling and can have both positive and negative ecological impacts on the forest ecosystem. This research aims to evaluate a medium-sized chainsaw's operational and environmental performance during a second thinning carried out by a full-tree system on Calabrian Pine high forests.

MATERIALS AND METHODS

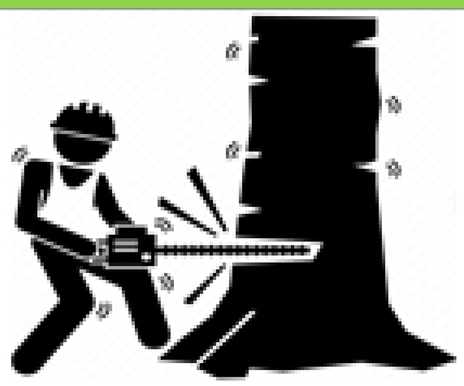
- Trees were located at an altitude of 1100 m a.s.l., had on average diameter at the breast height of 30.6 cm and height of 18 m, for a density of 950 trees ha^{-1}. The terrain roughness presents obstacles on less than 1/3 of the surface, while the slope was between I and II classes (0-40%).
- A work time study was conducted. Thirty operational cycles were registered: observed time was separated into working time, which included main and complementary working times, calculated as average gross productivity inclusive of all delays up to the maximum event duration of 15 minutes.
- The life cycle assessment (LCA) approach was adopted for environmental performance. As the Functional Unit, 1 m^3 of round wood was chosen. The inventory data related to background processes were collected from Agribalyse 3.0.1. while data from the foreground, such as materials and fuel consumption, were directly collected. Environmental impact data were processed using OpenLCA software and the ReCiPe 2016 method at the midpoint level.

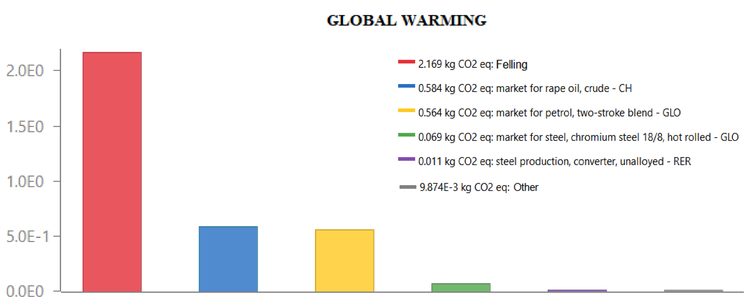


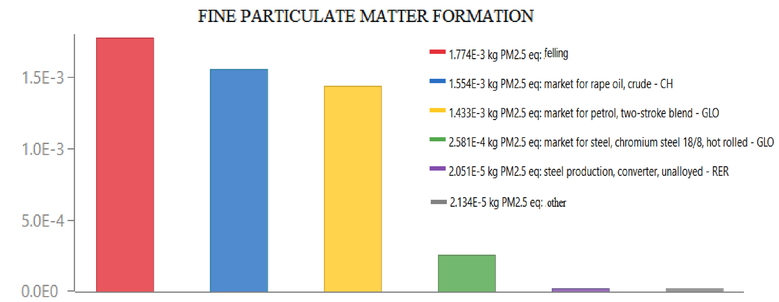
RESULTS

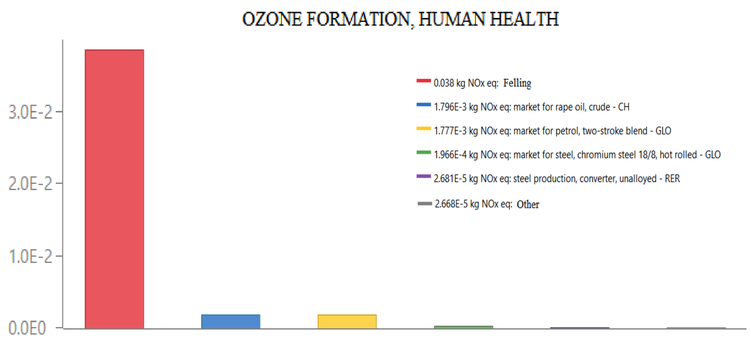
Team: 2 workers
Productivity: 10.30 trees h^{-1}
Volume of timber felled: 11.2 m^3 h^{-1}

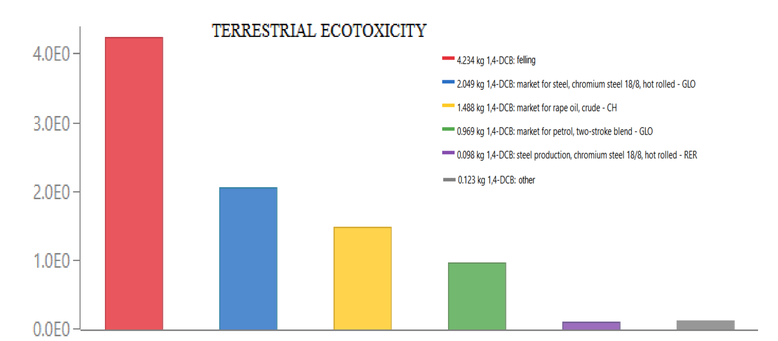
41 trees d^{-1} $worker^{-1}$
volume of timber felled of 44.8 m^3 d^{-1} $worker^{-1}$











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