Estimate of canopy bulk density through clip-on fisheye lens: an easy fix to forest fires simulations

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Forest fires are a natural disturbance largely affected by global changes, especially by anthropic pressure. At the same time, forest fires can be a menace to human lives and activities, and the phenomenon needs control in the most critical areas. One of the tools available to land managers to assess forest fire risk is fire simulation.

Forest fire simulators can highlight the most critical sectors of a landscape, but they need several input information, some of which is not routinely collected. In addition, for some information expensive procedures or dedicated instruments are required. One example is the value of canopy bulk density (CBD), a parameter often assumed as constant because its direct measurement requires destructive sampling of trees.

Alternatives to direct sampling of CBD have been found, with satisfactory results. One of the best proxies is the leaf are index (LAI), a common parameter collected in agricultural and ecological research. Nonetheless, its use outside academia is not common, often due to the need of specific tools and dedicated software to analyse the data.

In this study, a smartphone with a clip-on fisheye lens, and a free software have been used to overcome the aforementioned limitations. LAI has been sampled in 6 *Pinus spp.* forests in North-East Italy in the context of the EU Interreg Project CROSSIT SAFER, and the results have been compared to values from other studies. Despite the lack of destructive sampling in the same forest plots, the methodology seems promising, providing more reliable values compared to constant values often used in simulations.

With this affordable equipment it was possible to give a more detailed figure of CBD over a landscape, consequently giving more detailed input for forest fire simulators. Although results are not conclusive, the procedure can be easily implemented by land managers when assessing the forest fires risk of their territories.