



Assessing the land expectation value of even-aged vs coppice-with-standards stand management and long-term effects of whole-tree harvesting on forest productivity and profitability

Abdelwahab Bessaad^{1,2} · Jean-Philippe Terreaux¹ · Nathalie Korboulewsky²

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Abstract

• **Key message** Whole-tree harvesting makes forests more profitable than conventional harvest as long as the impact on tree growth remains under 2.3% for even-aged oak (*Quercus petraea* (Matt.) Liebl.) and 3.4% for sweet chestnut (*Castanea sativa* Mill.) coppice with oak standards. Coppice-with-standards may have potential to be more profitable than even-aged oak in case of 50% rise in fuelwood prices with 10% decrease in timber prices.

• **Context** Making the shift to renewable energy sources requires increasing biomass removal from the forest in a sustainable way. Today, the most common practice for forest biomass extraction is whole-tree harvesting rather than conventional harvest in which only stems are harvested or sometimes branches larger than 7 cm in diameter. However, intensive biomass harvesting can certainly increase economic profitability but it could affect long-term forest productivity because more nutrients are exported from sites.

• **Aims** We explored the land expectation value of even-aged oak (*Quercus petraea* (Matt.) Liebl.) and sweet chestnut (*Castanea sativa* Mill.) coppice with oak standards under different discount rates and wood prices scenarios, tree mortality triggered by climate variation as well as the effects of a decrease in forest productivity due to whole-tree harvesting on the land expectation value (LEV).

• **Methods** We modeled two plausible harvesting scenarios for both stands and assessed their LEV. We first analyzed the sensitivity of the valuation results to discount rate, wood prices changes, and increased tree mortality rates. Second, we compared conventional harvest to whole-tree harvesting in which removing the fine wood implies a decrease in tree growth over the long term (between 1 and 10%).

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✉ Abdelwahab Bessaad
abdelwahab.bessaad@inrae.fr

Jean-Philippe Terreaux
philippe.terreaux@inrae.fr

Nathalie Korboulewsky
nathalie.korboulewsky@inrae.fr

¹ INRAE, UR ETBX, 50 Avenue de Verdun, Gazinet,
F-33612 Cestas, France

² INRAE, UR EFNO, Domaine des Barres,
F-45290 Nogent-sur-Vernisson, France