

# Spatial Decision Support System for harvesting and wood system selection in chestnut coppices: a GIS-AHP application in Central Italy

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Sustainable forest operations require planning tools capable of balancing productivity, environmental protection, and social acceptability, particularly in complex and environmentally sensitive forest contexts. In Mediterranean small-scale forestry, however, harvesting decisions are still frequently based on individual expert experience rather than on structured and transparent decision frameworks.

This study investigates the application of a GIS-based Analytic Hierarchy Process (GIS–AHP) decision support system to support the selection of harvesting and wood systems in chestnut coppices of central Italy. The approach integrates spatial information with multi-criteria analysis to assess the suitability of three extraction systems (forwarder, cable skidder, cable yarder) and three wood systems (CTL, WTH, TLS) across 162 forest management units covering 1,332.5 ha. Criterion weights were derived from four stakeholder groups (researchers, technicians, forest owners, and workers; n = 144) to examine how differences in expert perspectives influence the final recommendations.

Although statistically significant differences emerged in the mean suitability values assigned by the stakeholder categories, the resulting operational recommendations showed a high level of consistency. The cable skidder was identified as the most suitable extraction system across most of the study area (94–100% depending on stakeholder group), with agreement among all groups in 87.7% of the forest management units. A similar pattern was observed for wood systems, where WTH predominated over 96.1% of the analysed area, with consensus in 95.1% of the units.

These results suggest that the GIS–AHP framework can generate stable recommendations even when different stakeholder perspectives are considered, highlighting its potential as a transparent and practical decision-support tool for harvesting planning in Mediterranean chestnut coppices.