

# Can Viticultural Mechanisation Make Steep Slope Vineyards Economically Sustainable?

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*Purpose:* The purpose of this paper is to empirically estimate machine and labour costs for mechanisation options of viticultural processes. We identify opportunities for wine producers to improve their economic profitability by increasing viticultural mechanisation.

*Methodology:* By identifying three external factors that determine the degree of optimal mechanisation of the most costly viticultural processes, we develop a typology of unique vineyard types. To estimate the effect of these factors on production costs we conducted analysis of variance with fixed and random effects for more than 2,800 single working time records for ten of these vineyard types.

*Findings:* Mechanisation of general viticultural processes, harvesting and pruning strongly affect viticultural costs. Minimal pruning provides significant cost saving potential of up to 1,820 €/ha in flat and steep slope vineyards that permit mechanised harvest. Steep slopes suffer from significant cost disadvantages of up to 5,366 €/ha that can only be partially compensated by mechanisation. Future price reductions are required to make the steep slope harvester competitive to manual harvest.

*Practical implications:* The results can aid producers to make cost-efficient decisions in their choice of viticultural systems and provide benchmarks for the comparison of their labour and machine working time records. Results provide guidance to public policy about subsidies required to compensate wine growers to preserve steep slope viticulture for public benefits and to assess cost-savings from restructuring steep-slope vineyards into transversal terraces.

*Limitations:* Records from the first two years of a long-term project are presented here that result in small sample sizes for rare vineyard types. Further research with larger sample size is required to model interaction effects between the factors and to generalise findings to other countries and different viticultural conditions.

**Keywords:** viticulture; labour force demand; minimal pruning; mechanisation; steep slope viticulture

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