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ECOSYSTEM GOODS AND SERVICES FROM PLANTED FORESTS

Abstracts of the scientific forum of the International
Congress on Cultivated Forests
3rd – 7th October 2006, Bilbao, Spain



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The unsustainability of selected *Pinus radiata* plantations in the Basque Country (northern Spain)

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Mechanical techniques for site preparation after clear-felling *Pinus radiata* plantations have been expanding in the Basque Country (northern Spain) since the last decade of the 20th century. Although these techniques have been shown to produce intense processes of land and soil degradation, some stakeholders argue that the systems are capable of recovering from such stresses. In this paper, we analysed the long-term effects of mechanical site preparation techniques compared to those caused by the traditional site preparation technique of slash-burning, without further soil disturbance, in the Lea-Artibai region (Basque Country). This analysis was based on a mass-balance of various soil indicators: soil mass and, total nitrogen, phosphorus, calcium, magnesium, and potassium contents. The inputs considered stemmed from atmospheric deposition and weathering of mudstones (the dominant underlying geological material). The outputs included were extractions from intermediate thinning and clear-felling, losses through drainage and soil erosion, and in the case of mechanical site preparation, material displaced in windrows was also considered. The input-output balance was compared to the stocks of the various indicators in order to obtain an estimate of the sustainability time-scale for the various management systems. The results showed that atmospheric deposition was the main input of all soil nutrients except of phosphorus, which was the nutrient with the smallest rate of replenishment. Calcium inputs through atmospheric deposition were relatively high due to the presence of limestone quarries in the region. Nitrogen losses were mostly the result of material displacement in windrows for plantations using mechanical site preparation and of drainage and soil erosion for plantations using slash and burn. The main processes of phosphorus loss were wood extraction and soil erosion in traditional plantations, and soil erosion and soil displacement in mechanically prepared plantations. Calcium losses were mostly related to drainage for both systems, whereas magnesium and potassium outputs were the result of soil erosion. Plantations using mechanical site preparation showed negative input-output balances over a 40-year rotation for all indicators except for calcium, whereas those managed by slash burning showed a negative balance mainly for phosphorus, but also for soil mass and potassium. The comparison between these system balances and stocks highlight phosphorus as the most limiting factor in all these plantations, and the short-term unsustainability of plantations managed by mechanical site preparation due to the depletion of phosphorus, nitrogen, and magnesium in about two or three 40-year rotations.